



ADDITIONS AND ALTERATIONS  
DOTHAN HIGH SCHOOL - PSCA No. 7019

DOTHAN CITY BOARD OF EDUCATION  
Dothan, Alabama

# SPECIFICATIONS

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Date: December 12, 2008

ADDITIONS AND ALTERATIONS  
DOTHAN HIGH SCHOOL - PSCA No. 7019  
DOTHAN CITY BOARD OF EDUCATION  
Dothan, Alabama

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**ADDITIONS AND ALTERATIONS**  
**DOTHAN HIGH SCHOOL - PSCA No. 7019**  
**DOTHAN CITY BOARD OF EDUCATION**  
Dothan, Alabama

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## **SECTION 01001 - ADVERTISEMENT FOR BIDS**

Sealed proposals will be received by the Dothan City Board of Education in the Teacher's Center at the Dothan City Schools Central Office, 500 Dusy Street, Dothan, Alabama until 2:00 P.M. Thursday, February 19, 2009 for the construction of ADDITIONS AND ALTERATIONS - DOTHAN HIGH SCHOOL, DOTHAN CITY BOARD OF EDUCATION, Dothan, Alabama at which time and place they will be publicly opened and read. Work shall be in accordance with plans and specifications prepared by J. Michael Lee Associates, Inc. ARCHITECTURE and dated December 12, 2008.

A cashier's check or bid bond payable to Dothan City Board of Education in an amount not less than five (5) percent of the amount of the bid, but in no event more than \$10,000, must accompany the bidder's proposal. Performance and Payment Bonds and evidence of insurance required in the bid documents will be required at the signing of the Contract.

Drawings and specifications may be examined at the office of J. Michael Lee Associates, Inc. ARCHITECTURE, 203 Jamestown Boulevard, Suite 2, Dothan, Alabama, F.W. Dodge Plan Room, Montgomery, Alabama and AGC Plan Room, Dothan, Alabama.

Bid Documents may be obtained from the Architect upon deposit of \$200.00 per set, which will be refunded in full on the first two (2) sets issued to each General Contractor submitting a bona fide bid, upon return of documents in good condition within ten days of bid date. Other sets for General Contractors, and sets for subcontractors and dealers, may be obtained with the same deposit, which will be refunded as above, less cost of printing, reproduction, handling, and distribution.

A pre-bid conference will be held at 2:00 P.M. on February 10, 2009, in the Conference Room at Dothan High School, 1236 South Oates Street.

Bids must be submitted on proposal forms furnished by the Architect or copies thereof. All bidders bidding in amounts exceeding that established by the State Licensing Board for General Contractors must be licensed under the provisions of Title 34, Chapter 8, Code of Alabama, 1975, and must show evidence of license before bidding or bid will not be received or considered by the Architect; the bidder shall show such evidence by clearly displaying his or her current license number on the outside of the sealed envelope in which the proposal is delivered. The Owner reserves the right to reject any or all proposals and to waive technical errors if, in the Owner's judgment, the best interests of the Owner will thereby be promoted.

All bidders must be fully capable, both financially and in regards to experience, to perform and complete the work in a satisfactory manner and within the required time frame. Bidder shall have a minimum of three (3) years experience with a minimum of five (5) equivalent projects. If required by the Owner or Architect, the Bidder shall submit a statement of his experience, work force, financial status and ability to bond the project.

Nonresident bidders must accompany any written bid documents with a written opinion of an attorney at law licensed to practice law in such nonresident bidder's state of domicile, as to the preferences, if any or none, granted by the law of that state to its own business entities whose principal places of business are in that state in the letting of any or all public contracts.

Dothan City Board of Education  
Dr. Sam Nichols, Superintendent

J. Michael Lee Associates, Inc.  
ARCHITECTURE

## SECTION 01002 - GENERAL DESCRIPTION OF PROJECT

### 1. LOCATION OF PROJECT

Dothan High School is located at 1236 South Oates Street in the southern section of Dothan, Alabama. See drawing for Vicinity Map.

### 2. DESCRIPTION OF WORK

The work consists of two projects: The additions and alterations to the existing Science and Arts Building and the additions and alterations to the existing Fine Arts Building. The interiors of both buildings shall be refinished and the exterior of the Science and arts Building shall be refinished. The center courtyard in the Science and Arts Building shall be enclosed and new floors added at each level. The new Band Room in the Fine Arts Building shall be expanded with an addition on the east side. Both buildings shall be reroofed. See drawings for additional requirements.

### 3. SCOPE OF WORK

The work shall consist of all work shown and/or indicated in the drawings and specifications entitled: ADDITIONS AND ALTERATIONS TO DOTHAN HIGH SCHOOL - PSCA No. 7019, DOTHAN CITY BOARD OF EDUCATION, Dothan, Alabama, prepared by J. Michael Lee Associates, Inc. ARCHITECTURE and dated December 12, 2008.

### 4. CODES, REGULATIONS AND REQUIREMENTS

All work shall comply with the following:

- 2006 International Building Code
- 2006 International Plumbing Code
- 2006 International Mechanical Code
- 2006 International Fuel Gas Code
- 2006 International Fire Code
- 2005 National Electric Code
- 2004 Alabama Building Energy Conservation Code
  - ADAAG (Americans with Disabilities Act)
  - Life Safety Code, NFPA 101
  - Local Building Official's Requirements
  - Local and State Health Department Regulations
  - Local Engineering Department Regulations and Requirements

END OF SECTION



SECTION 01003 - INSTRUCTIONS TO BIDDERS

ABC Form C-2 - August 2001

9 Pages

## **SECTION 01004 - SUPPLEMENTAL INSTRUCTIONS TO BIDDERS**

### **1. RECEIVING BIDS**

Bids will be received by the Dothan City Board of Education until 2:00 p.m. Thursday, February 19, 2009. Bid proposals shall be delivered to the Teacher's Center at the Central Office of the Dothan City Schools, 500 Dusy Street, Dothan, Alabama. Bid proposals will be publicly opened and read aloud at the above stated time and place. Bids received after the bid opening time will not be considered.

### **2. QUALIFICATIONS OF BIDDERS**

Any person or group of persons wishing to be considered as the General Contractor for this project must hold a current Certificate of License issued to him by the Alabama State Licensing Board for General Contractors. The General Contractor so licensed shall be licensed in conformance with the provisions of Title 34, Chapter 8, Code of Alabama 1975 governing the licensing and work of General Contractors in the State of Alabama. Any person or group of persons not licensed in conformance with this law will not be considered for work on this project. Any person or group of persons representing themselves as a "General Contractor" for work on this project shall be so qualified and shall submit to the Architect and Owner along with his proposal, his license number and bid limit. This license number and bid limit must appear on the outside face of the envelope which contains his bid.

It is the intention of the Owner to award this contract to the Contractor fully capable, both financially and as regards to experience, to perform and complete the work in a satisfactory manner and within the stated time frame. Contractor shall have a minimum of three (3) years experience with a minimum of five (5) equivalent projects. If required by the Owner or Architect, Contractor may be required to submit a statement of his experience, work force, financial status and ability to bond the project. This information and any additional information must be submitted prior to bidding. This information may also be requested of the successful bidder prior to awarding of the contract if not previously submitted.

### **3. PRE-BID CONFERENCE**

A pre-bid conference will be held at 2:00 P.M. on Tuesday, February 10, 2009, in the Conference Room at Dothan High School, 1236 South Oates Street, Dothan, Alabama.

### **4. PROPOSALS**

Bid proposals shall be on the form provided in the specifications or copies thereof. Proposals shall be submitted in duplicate and enclosed in a sealed envelope marked "ADDITIONS AND ALTERATIONS TO DOTHAN HIGH SCHOOL - PSCA No. 7019, DOTHAN CITY BOARD OF EDUCATION, Dothan, Alabama " and bearing the name, address, license number and bid limit of the bidder.

Bids by partnerships must contain the name of all partners and be signed in a partnership name followed by the signature and designation of an authorized representative. Bids by corporations must be signed under the legal name of the corporation and the State of Incorporation, followed by the signature and designation of a person authorized to bind it in the matter. Any erasures or interlineations should be noted over the signature of the bidder. If words and figures conflict, words shall govern.

Oral proposals or modifications will not be considered. Written or telegraphic modifications will be considered if received before bid opening and if a letter of confirmation is received within 48 hours. Modifications should not reveal the amount of the original bid.

5. ALTERNATES

Bidders are required to bid on all alternates, if provided. Alternate bids shall be stated as additions or deductions to the base bid. Where an alternate does not involve a change in price, the bidder should insert the words "No Change". Bidders failing to bid on an alternate requested risk the award of the contract to other bidders even though the alternate method of construction selected is at a higher price. Bids containing any omission or conditions not called for may be rejected by the Owner.

6. RESIDENT CONTRACTOR PREFERENCE

As provided by law, preference may be granted to resident contractors in awarding of contracts in the same manner and to the same extent as provided by the laws of the state of domicile of the non-resident contractor under similar bidding circumstances. The bids of non-resident contractors shall be accompanied by a written opinion of an attorney at law licensed to practice in such non-resident contractor's state of domicile as to preference, if any or not, granted by the law of that state to its owner resident business entities in the letting of any or all public contracts.

7. ADDITIONAL INFORMATION REQUIRED

Each bidder shall submit along with his proposal a list of proposed subcontractors. The list shall also include the name of the proposed Job Superintendent.

8. BID GUARANTEES

A Bid Bond equaling 5% of the base bid, but in no case more than \$10,000.00, shall be made payable to the Owner and must accompany each bid. Bid Bond shall be on the standard form included in these specifications and be dated within 15 days of the date of opening. Bonds of the three lowest bidders will be retained until Performance and Payment Bonds are delivered by the successful bidder. All others will be returned as soon as practical. Bid Guarantees shall be submitted as a guarantee that the bidder will not withdraw his bid within 30 days of the bid date; and that if his bid is accepted, he will execute the contract and furnish the specified Performance and Payment Bonds within 10 days of notification of award; and with the understanding that the full amount of monies represented shall be forfeited to the Owner as proper compensation for any damage to the Owner due to the default of the bidder in any single or all particulars.

9. SALES AND USE TAX EXEMPTION

Materials incorporated into the Work are exempt from sales and use tax pursuant to Title 40, Code of Alabama 1975. Each Bidder shall include in his bid price, all sales and use taxes on all materials for this project. The sales and use taxes shall be deleted from the contract by change order on all materials purchased by the local Owner under the Alabama Building Commission Guidelines. The Guidelines are included at the end of this section.

10. BID WITH-DRAWAL AND PRICE INCREASES

No bid may be withdrawn within thirty (30) days of the bid opening. Bidders shall confirm prices on materials, labor and equipment for the duration of the project. No extra changes will be considered for increases in prices of material, labor or equipment.

11. CONSTRUCTION TIME, COMPLETION DATE AND LIQUIDATED DAMAGES

Construction time and completion schedule are of utmost importance to the Owner. Any delay in the completion of the work other than those provided for in the contract documents will cause inconvenience,

loss and damage to the Owner, therefore if any work remains uncompleted after the time specified, an amount equal to six percent (6%) of the total Contract Price per annum for the entire period that the work remains incomplete shall be paid to the Owner by the Contractor or shall be deducted from the final payment to the Contractor. This amount is not a penalty but liquidated damages sustained by the Owner. It shall be mutually understood and agreed upon by all parties hereto that such an amount is reasonable as liquidated damages. Construction time shall be limited to 480 calendar days from the date established in the Notice to Proceed.

12. BONDS

The accepted bidder shall furnish a Performance Bond and a Payment Bond, both in an amount equal to 100% of the contract price as surety for faithful performance of the contract. The premium for the surety bonds shall be included in the contract price.

13. SEPARATE CONTRACT

The Owner shall have the right to perform certain items of work with its own work force or by separate contracts. The General Contractor shall coordinate his work with that of the Owner and/or separate Contractors as required for the proper and timely completion of all work.

14. DISCREPANCIES

Bidders finding discrepancies in or omissions from the plans or specifications, or in doubt as to any interpretation shall notify the Architect, who will issue written instructions to all bidders. Bidders should act promptly to allow sufficient time for reply to reach them before the bid date. Bulletins so issued shall become part of the contract and are to be acknowledged in the proposal.

15. TECHNICALITIES

The Owner reserves the right to reject any and all bids and to waive technicalities and formalities.

END OF SECTION

## SECTION 01005 - FORMS

Proposal Form – ABC Form C-3 – August 2001	2 Pages
Unit Price Attachment	1 Page
List of Subcontractors and Job Superintendent Attachment	1 Page
Form of Bid Bond - ABC Form C-4 – August 2001	1 Page
Construction Contract – ABC Form 9-A – July 2006 (PSCA Version)	2 Pages
Performance Bond Form – ABC Form 9-B – August 2001 (PSCA Version)	3 Pages
Payment Bond Form – ABC Form 9-C – August 2001 (PSCA Version)	2 Pages
Application and Certificate for Payment – ABC Form C-10 – August 2001	1 Pages
Inventory of Stored Materials – ABC Form C-10 SM – August 2001	1 Page
Progress Schedule and Report – ABC Form C-11 – August 2001	1 Page
Contract Change Order – ABC Form 9-J – July 2006 (PSCA Version)	1 Page
Certificate of Substantial Completion – ABC Form C-13 – August 2001	2 Pages
Form of Advertisement of Completion – ABC Form C-14 – August 2001	1 Page
Detail of School Plaques - ABC Form C-16 - August 2001	1 Page
General Contractor's Roofing Guarantee - ABC Form C-9 - August 2001	2 Pages

## UNIT PRICE ATTACHMENT

The undersigned agrees to remove any unsuitable soil encountered and to replace it with engineered fill as indicated in Section 02300 - Earthwork and Site Grading for a Unit Price of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_) per cubic yard.

The undersigned agrees to remove any deteriorated light weight concrete roof deck and to replace it with new light weight concrete or other approved fill material for a Unit Price of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_) per cubic foot.

The undersigned agrees to remove any deteriorated wood nailers and blocking encountered in the roofing work and to replace it with new wood for a Unit Price of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_) per board foot.

Legal Name of Bidder: \_\_\_\_\_

Address: \_\_\_\_\_

By (legal signature): \_\_\_\_\_

Name (type or print): \_\_\_\_\_

Title: \_\_\_\_\_

**SUBCONTRACTORS AND JOB SUPERINTENDENT ATTACHMENT**

The undersigned proposes to use the following for the construction of the ADDITIONS AND ALTERATIONS TO  
DOTHAN HIGH SCHOOL - PSCA No. 7019 – Dothan, Alabama

Site Work: \_\_\_\_\_

Concrete: \_\_\_\_\_

Masonry: \_\_\_\_\_

Roofing: \_\_\_\_\_

Wood Doors: \_\_\_\_\_

Windows: \_\_\_\_\_

Aluminum Storefront: \_\_\_\_\_

Hardware: \_\_\_\_\_

Drywall: \_\_\_\_\_

Acoustical Ceilings: \_\_\_\_\_

Hard Tile: \_\_\_\_\_

Painting: \_\_\_\_\_

EIFS: \_\_\_\_\_

Mechanical: \_\_\_\_\_

Plumbing: \_\_\_\_\_

Electrical: \_\_\_\_\_

Job Superintendent: \_\_\_\_\_

Legal Name of Bidder: \_\_\_\_\_

Address: \_\_\_\_\_

By (legal signature): \_\_\_\_\_

Name (type or print): \_\_\_\_\_

Title: \_\_\_\_\_

SECTION 01006 - GENERAL CONDITIONS OF THE CONTRACT

ABC Form C-8 - August 2001

54 Pages



## SECTION 01007 - SUPPLEMENTARY GENERAL CONDITIONS

1. The following changes, deletions and/or additions shall be made to the GENERAL CONDITIONS OF THE CONTRACT. Where any part of the General Conditions is modified, the unaltered provisions of that part shall remain in effect.

2. Article 37 Paragraph B (5) Builders' Risk Insurance

Add the following:

The Contractor shall purchase and maintain for the duration of the work Builder's Risk Insurance in an amount equal to the Contract sum.

3. Add the following Article 52 to the General Conditions:

### Article 52 – SALES AND USE TAX EXEMPTION

Pursuant to Title 40 (Revenue and Taxations), Code of Alabama 1975, the gross proceeds of the sales of tangible personal property to the State of Alabama, counties and incorporated municipalities, county and city school boards, independent school boards and all educational institutions and agencies of the state, counties and municipalities are exempt from sales and use taxes. Such entities may exercise their tax exempt status and save the costs of sales and use taxes to be paid on tangible personal property incorporated into their building construction and improvement projects. "Tangible personal property" will be referred to as "materials" and include materials, supplies, equipment and other items necessary for the performance of building construction or improvements work by a contractor and its subcontractors.

In order to preserve its tax exempt status in a building construction or improvement project, the Owner must purchase the materials, not the Contractor. On this project, the Owner intends to implement the arrangements required to save the sales and use taxes. Contractor shall see Guidelines included at the end of Section 01004 of these specifications and shall allow for the required arrangements. The Contractor shall include all sales and use taxes in his bid amount and shall reimburse the Owner by Change Order for all sales and use taxes saved under this arrangement.

4. Add the following Article 53 to the General Conditions:

### Article 53 - RESIDENT CONTRACTOR PREFERENCE

As provided by law, preference may be granted to resident contractors over non-resident contractors in awarding of contracts in the same manner and to the same extent as provided by the laws of the state of domicile of the non-resident contractor under similar bidding circumstances. The bids of non-resident contractors shall be accompanied by a written opinion of an attorney at law licensed to practice in such non-resident contractor's state of domicile as to preference, if any or not, granted by the law of that state to its owner resident business entities in the letting of any or all public contracts.

5. Add the following article 54 to the General Conditions:

### Article 54 – LOCAL PREFERENCE

As provided by law, the City of Dothan may grant preference to a local Contractor over a non-local contractor whose bid is within 3% of a lower bid.

END OF SECTION

## SECTION 01008 - SPECIAL CONDITIONS

### 1. DEFINITIONS

- 1.1 Owner: The term "Owner" used herein refers to the Dothan City Board of Education. Unless otherwise stated, all papers required to be delivered to the Owner shall be forwarded through the Architect.
- 1.2 Architects: The term "Architect" used herein refers to J. Michael Lee Associates, Inc., ARCHITECTURE, 203 Jamestown Boulevard, Suite 2, Dothan, Alabama, 36301, Phone: (334) 792-4726, Fax: (334) 792-4069.

### 2. SALES AND USE TAX EXEMPTIONS

- 2.1 See Guidelines at end of Section 01004 and Supplementary General Conditions for requirements concerning Sales and Use Tax Exemptions. Contractors shall include all sales and use taxes in their bid price. Taxes shall be reimbursed to the Owner by Change Order.

### 3. ROYALTIES, PATENTS, PERMITS AND INSPECTION FEES

- 3.1 Royalties and Patents: The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringements of any patent rights and shall save the Owner and Architect harmless for loss on account thereof.
- 3.2 Building Permits: The Contractor shall obtain all building permits prior to beginning work. Upon obtaining the building permit, the Contractor shall notify the Architect of such and only then shall any work be started. The City of Dothan will not charge for the building permit.
- 3.3 Inspection Fees: The Contractor shall obtain all required inspections by applicable authorities and shall pay all required inspections fees.

### 4. SURETY BONDS

- 4.1 Performance Bond and Payment Bond shall be furnished within 10 days of the notice of the contract award as security for the faithful performance of the contract and payment of labor, materials and equipment for the project. Bonds shall be written by an approved surety company authorized to do business in the state. Performance Bond shall extend as a Maintenance Bond for one year after acceptance of the work as a guarantee that any defects which may develop during that time will be corrected.
- 4.2 Performance Bond and Payment Bond shall each be in an amount equal to one hundred percent (100%) of the contract amount. Bonds shall be on forms provided in these specifications. Power of Attorney shall be included.

### 5. PRE-BID CONFERENCE

- 5.1 A Pre-Bid Conference will be held at 2:00 P.M. on Tuesday, February 10, 2009, in the Conference Room at Dothan High School at 1236 South Oates Street, Dothan, Alabama.

## 6. TIME OF COMPLETION

- 6.1 All work under this contract shall be completed within four hundred eighty (480) consecutive calendar days after the commencement date established in the Notice to Proceed.
- 6.2 The General Contractor and each subcontractor shall promptly prepare and submit to the Architect a schedule of the operations, so planned to insure completion of the work within allotted time for completion. In the event the Contractor shall, for any reason, fall behind schedule, he shall promptly take such steps (which may include additional workers, extra shifts, and overtime shifts) as may be required to expedite the work to insure that it shall be fully completed within the stated time.
- 6.3 See General Conditions for Liquidated Damage Requirements.

## 7. CONSTRUCTION MEETINGS

- 7.1 Prior to start of construction, a pre-construction conference shall be held for the purpose of determining construction schedules, procedures, requirements, etc. This pre-construction conference shall be attended by the Owner, Building Commission Inspector, Architect, General Contractor and representatives of all Subcontractors.
- 7.2 During the construction, General Contractor and Subcontractors shall hold regular meetings (at least weekly) to review schedule and progress of work. At these meetings, all problems arising during the previously work week shall be presented and solutions determined. The General Contractor shall make the required adjustments and shall issue the necessary instructions to expedite the work and maintain the schedule.
- 7.3 During the construction, the General Contractor shall meet monthly (or more often if required by the Architect) with the Owner and Architect to review the status of the work and to make any adjustments needed to the schedule. At these meetings, the General Contractor shall present any problems related to the school operations that are delaying the work.
- 7.4 Prior to the beginning of any roofing work, a Pre-Roofing Conference shall be held and shall be conducted by the Architect and attended by the Local Owner, Building Commission Inspector, General Contractor, Roofing Contractor, Sheet Metal Contractor, Roof Deck Manufacturer, and the Roofing Materials Manufacturer. The purpose of the Conference is to facilitate and promote the successful installation and performance of the entire roof assembly.

## 8. DRAWINGS AND SPECIFICATIONS

- 8.1 It is the intent of the Contract Documents that the Contractor shall provide a lump sum price for all labor, materials, equipment, appliances, etc. necessary for the proper and total completion of the work indicated and/or inferred.
- 8.2 Drawings and specifications are complementary. Whatever is shown or reasonable inferable from either shall be as if required by both. Dimension figures shall take precedence over scale dimensions and large scale drawings shall take precedence over smaller scale drawings. If drawings and specifications conflict or require any clarification which was not obtained prior to bidding, the Contractor shall furnish the greater quantity or better quality. No deviation shall be made from plans and specifications except upon written order of the Architect.

- 8.3 Supplementary drawings as may be necessary to carry out the work will be furnished later, and will be true developments of original plans and reasonable inferable therefrom. Such drawings shall become fully a part of the Contract Documents.
- 8.4 It is not the intent of these specifications to establish trade jurisdictions or areas of responsibility. The General Contractor shall establish all jurisdictions and responsibilities. Where installation and connection are specified under a particular section of the specifications, it is not intended to necessarily require the installation and connection by that trade but that this supplier or manufacturer is the recognized specialist or expert on this particular product and shall be available for consultation and/or instruction on the installation and connection. The final responsibility for the fulfillment of the entire specified requirements shall be with the General Contractor. All subcontractors shall be very clear and concise in identifying the work which they will perform at the time of submitting prices to the General Contractor.
- 8.5 The Architect shall furnish to the Contractor twelve (12) sets of plans and specifications for construction purposes. Additional sets and partial sets required by the General Contractor, subcontractors and suppliers shall be purchased by same by paying the cost of reproduction.

## 9. SCHEDULE OF VALUES

- 9.1 As a prerequisite to the first monthly payment, the Contractor shall prepare for approval a cost breakdown showing the value assigned to each of the various portions of the work. The schedule shall be prepared on the Payment Application and Certificate Form. Sample of form will be furnished.
- A. The contractor's general overhead and profit shall be distributed into the various categories indicated on the form. His on-site supervision and other direct costs shall be included in the category "General Requirements". The 16 work divisions should adhere to the work categories as defined in the Construction Specifications Institute specification format.
- B. Upon approval, this schedule will form the basis of approval for monthly progress payments.

## 10. MATERIALS AND WORKMANSHIP

- 10.1 All materials furnished shall be new and without any indication of damage or overage. If usually packed, they shall be brought to the job in the original un-broken labeled containers.
- 10.2 Brand names mentioned are intended to establish a standard of design and quality. Except where indicated otherwise, other makes of equal quality and suitability may be used, subject to written approval of the Architect, who reserves the sole right to decide equality of materials. Where two or more manufacturers are listed, the product must be furnished by one of the manufacturers so listed unless specific approval of other brand is obtained in writing. Comparison of other brands will be with the first named of those listed.
- 10.3 Materials not specified but required, and those partially described, shall be of the best grade suitable.
- 10.4 Installation of all materials and products shall be in accordance with the manufacturer's directions and recommendations unless otherwise specified.

- 10.5 Workmanship shall be equal to best standard practice, with work performed by skilled craftsmen only. All work shall be performed under the direction of a competent superintendent.

11. CONSTRUCTION UTILITIES

- 11.1 Water and electrical power required for the construction shall be furnished by the Owner. The Contractor shall make all arrangements, installations, construction, connections, etc. necessary to bring either permanent and/or temporary service from the present locations to the construction area. Coordinate with the appropriate Utility Companies.

12. EXISTING CONDITIONS

- 12.1 The Contractor shall visit site and shall verify all existing conditions prior to bidding. He shall make himself familiar with all existing conditions, including all areas where the work is to be done, available space for storage of materials and equipment, available space for parking of construction equipment and workman's vehicles, scheduling requirements, etc.
- 12.2 The Contractor shall verify all existing conditions where new work is to be done and where new work ties into or connects to existing work. Contractor shall verify any modifications of existing construction which will be required to properly tie in or connect new construction to existing. Contractor shall verify any existing conduits, pipes, ducts, equipment, etc. which will have to be removed, relocated, adjusted or modified in order to properly install new work. Contractor shall include in his proposal the cost of all labor, materials and equipment required to make such modifications to existing conditions.

13. COORDINATION AND SCHEDULING OF WORK

- 13.1 The normal functions and operations of the school must continue during the construction and construction activities shall not be allowed to interfere with school operations and activities. The General Contractor shall isolate the construction activities from the other school activities with the shown construction fence.
- 13.2 Contractor shall meet with the Owner and Architect immediately after award of the contract to discuss construction scheduling and procedures. Following this meeting, the Contractor shall prepare a detail schedule of construction activities and requirements for the Owner's review and approval
- 13.3 The Contractor shall begin the work on the existing Fine Arts Building first and shall complete this work as soon as possible. The Fine Arts Building shall be returned to use by the Owner as soon as possible.

14. TEMPORARY FACILITIES

- 14.1 The Contractor shall provide all temporary facilities required to complete the work. Temporary facilities shall include, but not limited to, the following:
- A. Suitable and sanitary toilet facilities for the workmen during the course of construction shall be provided. The facilities shall be kept clean and sanitary and shall be removed at the completion of the construction. Construction workers shall not use school toilets at any time.
  - B. First aid cabinet shall be provided for use in construction accidents.

- C. Fire fighting equipment for shed, new work, etc. shall be provided in conformance with requirements of the National Board of Fire Underwriters and Insurance Companies.
- D. Adequate facilities for storage of materials and equipment shall be provided.
- E. Barricades, scaffolding, rails, fences, lighting, warning light, signs, guards, flagmen and other safety devices and precautions as required to protect students, school personnel, construction personnel, the public and the work, shall be provided. All items shall comply with recognized safety rules and any prevailing laws or ordinances applicable thereto.
- F. Adequate facilities for drinking water shall be provided.
- G. Telephone service at the project site shall be provided for the duration of the construction period.
- H. Temporary walkways, ramps, enclosures, fences, rails & other facilities required to maintain access to work site and to protect the work, workers and the public.
- I. Construction fences shall be provided as required to isolate the construction activities, equipment and material storage (lay-down) areas and to maintain a safe and secure site. Fence shall be 6'-0" high chain link and location shall be approved by the Architect prior to installation. Fences shall be properly maintained until removal. Fences shall not interfere with the normal operations of the School except under special circumstances and arrangements. Safety and security of the construction site shall be maintained at all times.

## 15. SECURITY / PROTECTION PROVISIONS

- 15.1 The types of temporary security and protection provisions required include, but not by way of limitation, barricades, warning signs, construction site limits enclosure, environmental protection, and similar provisions intended to minimize property losses, personal injuries and claims for damages at project site. Provide security/protection services and systems in coordination with activities and in a manner to achieve 24-hour, 7 day-per-week effectiveness. Security provisions shall be coordinated with Owner's security personnel.

## 16. JOB SUPERINTENDENT AND SUBCONTRACTORS

- 16.1 Before the execution of the contract, the Contractor shall submit for approval a list of proposed subcontractors and job superintendents. Once approved, subcontractors and job superintendents shall not be changed without approval of the Architect. Request for change shall be made in writing.
- 16.2 A full time Job Superintendent shall be employed and shall be present at the job site at all times when work is in progress.
- 16.3 Subcontractor Qualifications: Only competent and experienced subcontractors shall be employed. The Architect reserves the right to disqualify any subcontractor to whom he has a reasonable objection. Subcontractors shall be licensed by the State Licensing Board for General Contractors where required.

- 16.4 Subcontractor Contractual Relationship: Nothing in the contract documents shall create a contractual relationship between subcontractors and the Owner, but the Contractor shall cause appropriate provisions to be inserted in all subcontracts to bind subcontractors to the terms of the General and Special Conditions and other Contract Documents insofar as is applicable.
17. SHOP DRAWINGS, SUBMITTAL DATA AND SAMPLES
- 17.1 Shop Drawings: The General Contractor shall submit bound in sets of five (5) copies, all shop drawings and other submittal data to the Architect for review, after thoroughly checking and coordinating each one and affixing his signature of approval thereto. The Architect will review drawings for design only, and will assume no responsibility for dimensions, quantities or erection procedures indicated. Three reviewed copies will be returned to the Contractor for his use.
18. TESTING AND INSPECTION OF WORK
- 18.1 Testing of materials is required as specified or if, in the opinion of the Architect, portions of the work fail to meet requirements of plans and specifications or may prove insufficient for purpose intended. Testing shall be done by an agent or laboratory acceptable to the Architect with all costs paid by the Contractor unless otherwise stated herein. All field tests shall be made in the presence of the Architect.
- 18.2 Inspection of Work: Afford Architect and public authorities every facility for inspecting work. Give ample notice of readiness or portions of work for inspection. Covering any portion of work for which inspection is required without the Architect's or other requiring authorities' prior approval shall be uncovered and so inspected at the Contractor's expense. Acceptance or approval shall not relieve the Contractor of responsibility for defect which subsequently develop or become apparent.
- 18.3 Contractor shall monitor, test, inspect, etc. all work as required by the City of Dothan, State of Alabama and ADEM. Contractors shall submit all required reports and shall pay all costs.
19. PERIODIC AND FINAL CLEAN-UP
- 19.1 During construction, the Contractor shall keep all work and storage areas reasonable free of debris. No work tools, construction materials, etc. shall be left in areas occupied by students. All debris and demo materials shall be immediately removed from the building and stored in a secure area until permanently removed from the site.
- 19.2 Contractor shall limit all construction activities, tools, equipment, etc. to the immediate work areas and shall not leave tools and equipment unattended.
- 19.3 At the completion of the work, the Contractor shall clean all work and storage areas, removing all tools, equipment, debris, rubbish and surplus materials. All building surfaces, furnishings, equipment, etc. shall be wiped down to remove construction dust. All carpet shall be vacuumed and tile floors shall be mopped. Contractor shall leave the buildings and grounds in first class condition, ready for the Owner's use.
- 19.4 The Contractor shall repair or replace any item of the building, contents or grounds which were damaged as the results of this work or the lack of protection.

20. WARRANTIES, GUARANTEES, ETC.

- 20.1 All work under this Contract shall be guaranteed by the Contractor against defects resulting from the use of inferior materials, equipment, or faulty workmanship for one year from the date of final completion. This guarantee shall be in writing from the Contractor and shall cover all points listed in Paragraph 49 of the General Conditions.
- 20.2 General: Duration of all warranties, guarantees, etc. shall be determined from the date of final acceptance and shall be delivered on completion of the work. The Contractor shall also furnish maintenance manuals, manufacturer's warranties, and other information pertaining to all materials installed.
- 20.3 Special Warranties and Guarantees: The General Contractor and subcontractors shall furnish written warranties and guarantees covering the specific items for the designated periods as specified in the individual sections for the Specifications.

21. PROJECT CLOSE-OUT

- 21.1 The Contractor shall furnish to the Owner one (1) set of "Record" drawings showing all changes made during the construction and the exact location of all concealed service facilities (pipes, wires, etc.).
- 21.2 The Contractor shall furnish to the Owner all Certificates, Waiver and Release of Lien, Warranties, Guarantees, etc. required to close out the project.
- 21.3 The Contractor shall advertise the completion of the project in accordance with the General Conditions and shall provide proof of advertisement as a prerequisite to final payment. Form of Advertisement of Completion is included in Section 01005.

22. YEAR END INSPECTION

- 22.1 Near the end of the Contractor's one-year warranty period an inspection shall be held to determine any deficiencies which need repair or correction under the one year warranty. This inspection shall be attended by the Architect, Building Commission Inspector, Owner's Representative, Contractor and applicable Consulting Engineers and Subcontractors. Contractor/Subcontractors shall promptly repair and correct any deficiencies noted.

23. BIDDER QUALIFICATIONS

- 23.1 It is the intention of the Owner to award this contract to the Contractor fully capable, both financially and in regards to experience, to perform and complete the work in a satisfactory manner and within the required time frame. Contractor shall have a minimum of three (3) years experience with a minimum of five (5) equivalent projects. If required by the Owner or Architect, the Bidder shall submit a statement of his experience, work force, financial status and ability to bond the project. This information and any additional information must be submitted prior to bidding. This information may also be requested of the successful bidder prior to awarding of the contract if not previously submitted.

END OF SECTION



## SECTION 01009 – ALTERNATES

### GENERAL

Before submitting proposals, all bidders shall read the entire set of plans and specifications and familiarize themselves with the requirements of each alternate and how each section of the work is affected by the acceptance of any or all alternates.

Each bidder shall state on the proposal form the amount to be added to the base bid or deducted from the base bid for making the following changes, including all incidental omissions, additions and adjustments as may be necessary or required by such changes.

Alternates will be considered and the low bidder determined as indicated in the Instructions to Bidders.

#### Alternate No. 1

Each bidder shall state in his proposal the amount to be deducted from his base bid for changing the 2" x 2" ceramic tile base and wall tiles to standard 6" x 4" coved glazed base and standard 4 1/4" x 4 1/4" glazed wall tiles.

#### Alternate No. 2

Each bidder shall state in his proposal the amount to be deducted from his base bid for changing regular ceiling tiles in corridors to standard square edge lay-in ceiling tiles as used in other areas of the building.

END OF SECTION

## SECTION 01010 - UNIT PRICES

### GENERAL

Unit prices will be used to cover work which is required but was not included in the base bid. Each bidder shall state in his proposal the unit prices for making the indicated additions to the work. Unit prices shall include all labor, materials and equipment to do the work. Unit prices shall include all overhead and profit for subcontractors and General Contractor.

### UNIT PRICES

Each bidder shall state in his proposal the unit price for the removal of unsuitable soil and replacing it with engineered fill as indicated in Section 02300 – Earthwork and Site Grading.

Each bidder shall state in his proposal the unit price for replacing deteriorated light weight concrete roof deck. Unit price shall be stated as the cost per cubic foot.

Each bidder shall state in his proposal the unit price for replacing deteriorated wood nailers and blocking encountered in the roofing work. Unit price shall be stated as the cost per board foot.

END OF SECTION

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END OF SECTION

## **SECTION 02200 - SITE PREPARATION**

### **PART 1 – GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. The General Provisions of the contract, including Division 1, General Requirements, apply to the work specified in this section.

#### **1.2 DESCRIPTION OF WORK**

- A. The work covered by this section consists of furnishing all equipment, labor and materials necessary to satisfactorily complete the site preparations and related work as indicated on the drawings and as specified herein.

### **PART 2 – PRODUCTS**

#### **2.1 PRODUCTS**

- A. Any products required to complete this work shall be of the best quality recognized by the trade standards and shall be manufactured for the intended use.

### **PART 3 – EXECUTION**

#### **3.1 EXISTING CONDITIONS**

- A. Contractor shall verify all existing conditions prior to bidding. Failure to do so will not relieve the Contractor of the responsibility of completing the required work nor allow the requesting of extras for work not observed but required. Any condition which differs from that shown or is not shown shall be brought to the attention of the Architect prior to bidding.
- B. Prior to beginning any work, the Contractor shall verify the exact location of all existing utilities in the construction area. Contractor shall modify existing conditions as required to allow for the proper completion of the proposed work. Proposed work may be adjusted or modified to fit existing conditions provided all adjustments and modifications are approved by the Architect in advance.
- C. Contractor shall verify the Owner's requirements concerning the access to the site, construction activities, scheduling, etc. Contractor shall comply with all requirements of the Owner and shall do nothing which will interfere with the operations of the Owner, cause damage to the Owner's property, or endanger the public.

#### **3.2 PROTECTION**

- A. The Contractor shall protect the Owner's property and adjacent property from damage at all times during this construction. The Contractor shall replace and/or repair any damage which occurs as a result of the work.
- B. The Contractor shall protect his work and materials until accepted by the Owner. The Contractor shall provide all means of protection required to properly protect the students, school personnel, construction workmen and the public. Construction fences, barricades, etc. shall be provided as indicated in the Special Conditions.

- C. The Contractor shall use proper methods of shoring, bracing, etc. Such items shall be in full compliance with applicable safety regulations. All construction and demolition methods and practices shall be in accordance with best recognized trade standards and OSHA requirements.
- D. The Contractor shall be fully responsible for the protection of all downstream and adjacent properties from damage resulting from this work. The Contractor shall provide and maintain adequate protective measures to accomplish this. Silt fences and other protective measures shall comply with requirements of the City of Dothan and ADEM. The Contractor shall replace and/or repair any damage which occurs as a result of this work.

### 3.3 COORDINATION

- A. All phases of the work shall be coordinated to insure the proper completion of all required work and to maintain safe working conditions at all times.
- B. Coordination of the work shall be the responsibility of the Contractor. The Contractor shall prepare a schedule of all work and shall submit it to the Architect and Owner for review prior to beginning any work.

### 3.4 DEMOLITION

- A. Contractor shall remove all existing construction, paving, curbs, utilities, etc. as indicated on the drawings or as required to properly complete the new construction.
- B. Contractor shall make all alterations, modifications, replacements, relocations, adjustments, etc. to the existing conditions, construction, equipment, utilities, etc. as required to properly complete the indicated work whether specifically shown or not. Notify the Architect prior to proceeding with work which is not shown or which is different than that shown. All modifications, adjustments, etc. shall be approved by the Architect prior to proceeding.
- C. Contractor shall remove from the site all debris resulting from this work. All earth which is not suitable for reuse in the construction shall be removed from the site by the Contractor. All earth reused as fill shall be spread and compacted by the Contractor. Compaction shall be at least 95% of the standard proctor density of the material except for fill under new construction which shall be compacted as engineered fill to at least 98% of the standard proctor density.

### 3.5 CLEARING AND GRUBBING

- A. All trees, stumps, brush, roots and other objectionable matter shall be removed from the building and pavement areas, areas where earth fill is to be placed and areas where earth cuts are to be made.
- B. Strip all top soil from the building and pavement areas and areas to be filled or cut. Topsoil shall be stockpiled in area directed by Architect for reuse. The Contractor shall be responsible for redistributing the top soil once the construction is completed. The redistributed top soil shall be left in a rough grade condition ready for fine grading by the Landscape Contractor.
- C. After the clearing and stripping of the site, the subgrade shall be inspected as described in Section 2B before any other work is done.

### 3.6 SITE LAYOUT

- A. Foundations, floor lines, walks, curbs and pavement shall be staked out and elevation established as indicated on the drawings. Batter boards shall be erected and lines run where necessary.
- B. Site layout work shall be checked and verified by Architect prior to proceeding with other work.
- C. Contractor shall confer with the Architect before beginning the layout of concrete walks, curbs, drainage structures, slabs, etc. The final layout and elevations of these items shall be verified with the Architect prior to pouring.

END OF SECTION

## **SECTION 02300 - EARTHWORK AND SITE GRADING**

### **PART 1 – GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. The General Provisions of the Contract, including Division 1, General Requirements apply to the work specified in this Section.

#### **1.2 DESCRIPTION OF WORK**

- A. The work covered by this section consists of furnishing all labor, materials and equipment required to satisfactorily complete the earthwork and site grading as indicated on the drawings and as specified herein.

#### **1.3 QUALITY CONTROL**

- A. The Contractor shall employ a Soil Engineer & Testing Laboratory to inspect the earthwork and to make the required soils and compaction tests and to submit the test reports to the Architect for approval. The Soil Engineer and Testing Labor shall be approved by the Architect prior to beginning work.

#### **1.4 TOPOGRAPHICAL AND GEOTECHNICAL INFORMATION**

- A. The Contractor shall verify all existing conditions and grades and shall familiarize himself with all information shown on the drawings. Any conditions which differ from that shown shall be brought to the attention of the Architect before the earthwork and grading operation is begun.
- B. The Contractor shall familiarize himself with all information shown in the attached Geotechnical Report and shall follow the stated recommendations.

#### **1.5 COMPACTION STANDARDS**

- A. Required densities of compaction are expressed herein in terms of percentages. Such terms shall mean percentages of the Standard Proctor, maximum dry density in accordance with ASTM D-698

#### **1.6 GENERAL INFORMATION REGARDING BASE BID AND UNIT PRICES**

- A. The Contractor's base bid shall include cleaning, stripping, filling and cutting of the site as indicated on the drawings and as described in Section 02200 – Site Preparation and this Section. The cutting of the site includes all cutting required to establish the subgrade elevations for foundations, paving, and finish grades as shown on the drawings. This cleared, stripped and cut condition of the site shall be referred to as "Grade Level A". The Contractors base bid shall include all fill material required to bring the site from "Grade Level A" up to the finished grade levels and elevations shown on the drawings.
- B. After the site has been cleared, stripped and cut to "Grade A Level", the Soils Engineer shall inspect and perform the necessary soil tests to determine the condition of the subgrade. At this point it may be necessary to remove additional unsuitable soils from the site. All materials removed from the site below "Grade Level A" will be done on a unit



price basis. The unit price shall be stated, along with the General Contractor's base bid, in the Proposal Form. The unit price shall be stated as a price per cubic yard. The measure of quantity of cubic yards removed shall be based on "loose" cubic yards of material removed and totaled as cubic yards per truckload. The unit price shall include removal of the unsuitable material and replacement with material meeting the requirements of "engineered fill" as described in these specifications. Any work performed under the unit price will be paid for by the Owner by Change Order.

#### 1.7 CONTROLLED AREA

- A. The "Controlled Area" shall be defined as those areas beneath and 5 feet beyond building structures, other structural foundations and all paved areas. All other areas shall be classified as general fill areas.

### PART 2 – PRODUCTS

#### 2.1 PRODUCTS

- A. Any product required to complete this work shall be of the best quality recognized by the trade standards and shall be manufactured for the intended use.

### PART 3 – EXECUTION

#### 3.1 CLEARING, STRIPPING AND CUTTING

- A. All vegetation, topsoil, stumps, abandoned foundations, utilities, pavement, curb, and /or otherwise unsuitable materials shall be removed from the "controlled areas". All topsoil shall be stored on the site and shall be redistributed after the site work is completed as directed the Architect. All unsuitable earth and all unsuitable materials shall be removed from the site by the Contractor and disposed of in a legal landfill.
- B. After clearing and stripping are completed, the existing grades shall be cut where required to bring the subgrades to the proper elevations for the foundations, paving and finish grades. Suitable cut material shall be stored for use as fill. Unsuitable materials shall be removed as stated above.

#### 3.2 EROSION CONTROL AND SITE DRAINAGE

- A. The entire site shall be maintained in a drained condition which will insure the continual removal of surface water that may flow over the site and the removal of shallow "perched" water expected in sections of the site. This should be accomplished by the installation of temporary and permanent drainage swales and drainage structures as the site work progresses.
- B. Protect newly graded areas from actions of the elements. Settlement or washing that occurs prior to acceptance of work shall be repaired and grades re-established to required elevations and slope. Finished grade and subgrade elevations shall be maintained by the Contractor until final acceptance of project by the Owner.
- C. The Contractor shall be fully responsible for any damage occurring to property downstream of the site which is the result of drainage or silt from the site. The Contractor shall fully inspect the site prior to commencing any work and take any precautions in addition to these herein specified which he deems necessary to protect the downstream

property. Controls and precautions shall comply with all applicable requirements of the State of Alabama and the City of Dothan. Contractor shall verify these requirements prior to bidding.

- D. The Contractor shall take all possible precautions to prevent erosion of all graded areas of the site. Commence all fills at outer most part of fill and slope towards original ground so that all surface storm water drains back away from fill and does not run over top of fill slope. Construct swales around top of cut slopes prior to making any cuts. Construct swales at bottom of proposed fill slopes prior to constructing any fills. Construct and maintain a swale at the outermost part of top of fills as fills are constructed.

### 3.3 SUBGRADE PREPARATION

- A. Following the removal of all topsoil, debris and organic material as described in Section 02200 and Section 02300, Paragraph 1.6, the exposed subgrade shall be inspected by the Architect and Soils Engineer. During this inspection the Contractor shall proof-roll the site with construction equipment to determine the presence of any latent weak and / or other wise unsuitable soil conditions. Test pits, supplemental boring, etc. may be required at this time to determine the location and extent of the unsuitable soil. During the site examination, the presence existing underground utilities, buried structures abandoned foundations, etc shall be identified. All existing utilities, buried structures, etc. which may interfere with the construction or performance of the development should be removed and backfilled with "engineered fill". Areas which exhibit weak soil or otherwise unsuitable conditions should be corrected in accordance with the recommendations of the Soils Engineer and Architect.
- B. Following the above work and prior to the placement of fill, the exposed subgrade shall be thoroughly densified using a sheeps foot roller exhibiting a static weight of at least 5 tons. Vibratory equipment shall not be used due to the possible disturbance of adjacent foundations and structures. The density of the subgrade within the "Controlled Areas" shall be improved to at least 98% of the materials ASTM D-698 Standard Density to a depth of twelve (12) inches and the subgrade outside the "Controlled Areas" shall be improved to at least 95%. Areas which fail to densify or which otherwise exhibit unsuitable soil conditions should be undercut to a firm level of soil followed by backfilling the undercut area using "Engineered Fill". Subgrade densities shall be verified by the "Soil Engineer" prior to the placement of any fill.

### 3.4 EARTH FILL

- A. Earth fill required to establish subgrade elevations in the "controlled areas" shall consist of clean, non-saturated, and non-organic sections of the native sand earth typical of that on the site. Earth fill required beyond that available from on-site cut shall be "select fill" originating from an off-site borrow source. The "select fill" shall consist of a clean, non-saturated, and non-organic clayey and/or silty sand that contains less than 30% sound aggregate particles of less than 2" diameter retained on a #4 mesh sieve, less than 25% passing a #200 mesh sieve, a liquid limit of less than 40% and a plasticity index of between six (6) and sixteen (16) percent.
- B. All earth fill placed in the "controlled areas" shall be designated as "Engineered Fill". Engineered fill shall be placed in thin lifts not to exceed 8" loose measure and each lift shall be thoroughly densified to at least 98% of the materials ASTM D-698 Standard Proctor maximum dry density. Moisture conditioning of the soils including the addition of

water or aeration may be required to achieve optimum moisture-density relationships (Proctors) and in-place density tests shall be performed to verify compliance with the compaction requirements. One density test per 3,000 square feet for each foot of vertical thickness of fill and for exposed subgrade.

- C. All earth fill placed outside the "Controlled areas" shall be placed similar to Paragraph 3.4 B but lifts shall be 12" and be densified to 95%.
- D. "Engineered Fill" exposed to excessive wetting, drying or otherwise disturbed by the construction following acceptance for moisture and density shall be retested followed by the correction of deficient areas just prior to the installation of additional fill or structures.

### 3.5 PLACEMENT OF EARTH FILL

- A. Remove debris subject to termite attack, rot, corrosion and other deleterious materials from areas where fill is to be placed. Prior to placing fill materials, scarify surface of ground to a depth of 6". Moisture content of loosened material shall be such that it will bond with the first layer of fill material.
- B. The fill material shall be placed in layers which do not exceed the thickness specified above. Each layer shall be spread and rolled until the required compaction is obtained before placing the next layer. If a layer of material is placed on a previous layer before it has reached the desired compaction, the Contractor, at his expense, shall remove the upper layer of fill and re-roll the fill until the desired compaction is reached. If necessary, soil shall be moistened, or allowed to dry to the correct moisture content, before compaction.
- C. The fill material shall be compacted (densified) to minimum densities specified above.
- D. All utility trenches shall be backfilled with "engineered fill".

### 3.6 SITE GRADING

- A. Do all cutting, filling, compacting of fills and rough grading required to bring the entire site to grades as indicated on the drawings. The grades and elevations on the drawings shall be interpreted as follows:
  - 1. The elevation given in any building area is the elevation of the top surface of the finished floor.
  - 2. The elevation shown in exterior paved areas, including all walks, parking areas and roads are elevations of the top surface of the finished pavement.
- B. Rough grading of all areas within the project, including excavated and filled sections and adjacent transition areas, shall be reasonably smooth, compacted and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from either blade grader or scraper operations, except as otherwise specified. The finished subgrade surface shall be not more than 0.20 foot above or below the established grade or approved cross section. All ditches, swales and gutters shall be finished to drain readily. Provide roundings at top and bottom of banks and at other breaks in grade. Site grading shall be coordinated with all other site work under this contract.

### 3.7 SHORING AND BRACING

- A. The Contractor shall accept full responsibility for all excavations. He shall protect all excavations against collapse. All excavations, trenching and shoring shall be performed in accordance with OSHA Regulations as outlined in the Federal Register Section 1518.650 - 1527.653 Subpart P - Excavations, Trenching, and Shoring.

### 3.8 REDISTRIBUTION OF TOPSOIL

- A. Upon completion of the site grading the Contractor shall redistribute the stockpiled topsoil. Topsoil shall be placed around the building and paved areas as directed by the Architect. Grading Contractor shall leave redistributed topsoil in a rough grade condition. Landscape Contractor shall do fine grading. Topsoil shall blend into natural grades at the perimeter.

### 3.9 SOILD ENGINEER AND TESTING LABORATORY

- A. The Contractor shall employ a Soils Engineer and Testing Laboratory to verify compliance with the specified compaction criteria. The Soils Engineer shall verify the results of site stripping, proof rolling, and the correction of the weak soil conditions. Laboratory soil particle size, Atterberg Limit and Compaction Tests shall be made on each different type of fill soil and subgrade soil. A minimum of one field density test shall be made on each 3,000 square feet of fill area (minimum of 2 tests of areas less than 6,000 square feet) for each foot of vertical thickness of fill and for exposed subgrade. One field density test shall be made per 75 lineal feet of wall footing and one field density test per isolated column footing.
- B. The Soils Engineer and Testing Laboratory shall submit Field Reports and test results to the Architect for approval. All field reports and test results shall be stamped and signed by the registered Soils Engineer.

END OF SECTION

GEOTECHNICAL REPORT (ATTACHMENT TO SECTION 02300)

20 Pages

## SECTION 02360 - SOIL TREATMENT AND TERMITE CONTROL

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Division 1, General Requirements, apply to the work specified in this section.

#### 1.2 DESCRIPTION OF WORK

- A. Provide complete protection against subterranean termite infestation with a soil poisoning treatment of the ground under all building floor slabs, foundations and around the perimeter of building.

#### 1.3 SUBMITTALS

- A. The Contractor shall furnish manufacturer's data, specifications, guarantee, test reports, material certification, and any other information that may be required to insure compliance with these specifications.

#### 1.4 GUARANTEES

- A. The Owner shall be given a written guarantee which shall provide that the soil poisoning treatment shall prevent termites from attacking the building or its contents for a period of not less than five (5) years.

If termite activity exists in or under the building during the guarantee period, the Contractor shall promptly and without expense to the Owner:

1. Re-treat the soil to prevent termites from attacking the building and its contents, using means acceptable to the Owner.
2. Make good all damage caused by termite activity

END OF SECTION

## SECTION 02840 - CONCRETE CURBS, WALKS AND PAVING

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Division 1, General Requirements, apply to the work specified in this Section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered in this section consists of furnishing all equipment, labor and materials necessary to satisfactorily complete the concrete curbs, walks and paving and any related items as indicated on the drawings and as specified herein.

#### 1.3 RELATED WORK

- A. The following items of related work are specified in other sections of these specifications:
  - 1. Earthwork and Site Grading
  - 2. Concrete Reinforcement
  - 3. Cast-In-Place Concrete

#### 1.4 SUBMITTAL

- A. The contractor shall furnish manufacturers data, test reports and material certifications as required in the related sections of these specifications.

### PART TWO - PRODUCTS

#### 2.1 MATERIALS

- A. Concrete and reinforcement shall meet all applicable requirements specified in Division 3. Concrete for curbs and walks shall have an ultimate compressive strength of 3,000 psi in 28 days. Concrete for paving shall have an ultimate compressive strength of 4,000 PSI in 28 days and flexural strength of 500 psi. Maximum slump shall be 5".

### PART 3 - EXECUTION

#### 3.1 JOB CONDITIONS

- A. Contractor shall verify all existing conditions and the effect they will have on this work. This work shall be done in such a manner as to maintain access to the site. This work shall be coordinated with other construction activities.
- B. Flagmen, barricades, warning signs and lights shall be used as required to accomplish the above and to maintain safe conditions in all respects.

#### 3.2 SUB-SURFACE PREPARATION AND FORMING

- A. Prior to placement of fill, the top 6" of the subgrade shall be densified to at least 98% of the materials ASTM D-698 Standard Density. All required fill shall be placed in accordance with Section 2B Earthwork and Site Grading.
- B. Base course shall be 6" of porous fill consisting of compacted sand-clay or crushed limerock. Sand-clay shall consist of coarse sand with clay content no more than 16%. Base course shall be compacted to at least 98% of the materials ASTM D-698 Standard Density. Forms shall be set to required grades and lines, rigidly braced and secured. Tolerance for top of forms shall not be more than 1/8" in 10' and vertical face on longitudinal axis shall not be more than 1/4" in 10'.
- C. Elevation and lines of subgrade, formwork, manholes and catch basins along with reinforcement shall be checked and approved by Architect prior to pouring of concrete.

### 3.3 CURBS

- A. Curbs shall be machine formed to profile and dimensions shown on the drawings or as required to match existing.

### 3.4 REINFORCEMENT AND CONCRETE PLACEMENT

- A. Reinforcement and concrete placement shall comply with the requirements as specified in Division 3.
- B. Unless otherwise noted on the drawings, reinforcement for concrete walks and paving shall be 6" x 6" #10/10 W.W.M.
- C. Unless otherwise noted on the drawings. Reinforcement for concrete paving shall be 6" x 6" #6/6 W.W.M.

### 3.5 JOINTS

- A. All joints shall be at locations shown on the drawings; where not shown, expansion joints shall be located at 20 feet on center and contraction joints shall be located at 5 feet on center in between expansion joints. Expansion and contraction (weakened-plan) joints shall be constructed as described and/or as detailed. All construction joints shall be made at expansion joints; other locations will not be permitted.

Expansion joints shall be made by setting filler strips at locations shown or specified. Top of redwood filler strips shall be set flush with surface of concrete. Edge of slabs at forms shall be finished with an edging tool forming a rounded edge with 2" radius. Tool marks shall be eliminated from top surface of concrete.

### 3.6 CONCRETE FINISHING

- A. Concrete shall be struck-off, consolidated and the surface smoothed by screening and floating, after floating the surface, trueness shall be checked with a 10-foot straightedge. All irregularities shall be corrected.



- B. Once the excess moisture and surface sheen have disappeared, the surface shall be given a broom finish with a fine-haired broom. A sample finish shall be made and approved by the Architect prior to proceeding with the remainder of the work. Direction of finish shall be perpendicular to direction of traffic.

END OF SECTION

## SECTION 02938 – LANDSCAPING

### PART ONE – GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provision of the contract, including Division 1, General Requirements, apply to the work specified in this section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered by this section of the specifications consists of furnishing all equipment, labor and materials necessary to satisfactorily complete the landscape work as indicated on the drawings and as specified herein.
- B. Landscaping work shall consist of furnishing, planting and maintaining the new trees and grass indicated on the drawings. Work shall include all fine grading, soil preparation, clean-up, etc.
- C. Landscaping work shall be closely coordinated with the other site work and construction work in order to avoid damage to finished work.

#### 1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All packaged materials shall be delivered to the site in unopened containers showing weight, analysis and manufacturer. Materials shall be protected from deterioration while stored on the site.
- B. Trees shall be freshly dug. Trees that have been in cold storage will not be accepted. Pruning shall not be done prior to planting. Trees shall not be bent or bound-tied in such a manner as to damage bark, break branches or destroy natural shape. Such damaged trees shall not be planted.
- C. Trees shall be delivered after preparation for planting has been completed and shall be planted immediately. If planting is delayed for any reason more than six hours after delivery, trees shall be set in the shade, protected from weather and mechanical damage and roots kept moist.
- D. Container grown stock shall not be removed from container until planting.
- E. Grass shall not be cut or stripped until soil is properly graded and prepared. Grass shall be delivered to the site and planted within 24 hours after stripping. Grass shall be protected from drying during delivery and until planting.

#### 1.4 JOB CONDITIONS

- A. The landscape contractor shall examine the subgrade, verify the elevations, observe the conditions under which the work is to be performed and shall notify the Architect of any unsatisfactory conditions. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions or obstructions, these conditions shall be corrected.

## PART TWO – PRODUCTS

### 2.1 LANDSCAPING MATERIALS

- A. Existing stockpiled topsoil shall be redistributed over the site by the General Contractor as directed by the Architect.
- B. Commercial fertilizer for trees shall not have less than 10% available phosphoric acid and from 3% to 5% total nitrogen and from 3% to 5% soluble potash. Mix with topsoil at the rate of not less than .25 lbs. per cu. ft. of soil and humus.
- C. Commercial fertilizer for grass shall be 8-8-8 and shall be mixed with topsoil in an amount of 29 lbs. per 1000 square feet.
- D. Peat humus shall be equal to FS Q-P-166 with the texture and PH range suitable for the intended use. Mix with topsoil in ratio of 1:3 for use in planting balled and burlapped or container grown trees.
- E. Manure shall be well rotted, unbleached stable or cattle manure, free from sawdust, refuse, shavings or harmful materials. Mix with topsoil in ratio of 1:3 for use in planting balled and burlapped or container grown trees and shrubs.
- F. Trees shall comply with the recommendations and requirements of ANSI Z60.1 "Standard for Nursery Stock" and as scheduled. All trees shall be wrapped from ground line to lowest branch. Trees shall have fully developed branch systems. Stick trees will not be accepted. Architect shall approve all trees prior to planting. Trees shall be type and size indicated on the drawings.
- G. Grass shall be strong, live green root sod, not less than 2 years old, free of weeds and undesirable native grasses. Provide only sod capable of growth and development when planted. Grass type shall be Centipede Grass. Grass to be planted as sod shall be in blocks not less than 12" square.
- H. Stakes and deadmen shall be sound new hardwood, treated softwood or Redwood, free of knotholes and other defects. Guys and ties shall be two strand, twisted, pliable galvanized iron wire not less than 14 gauge with zinc-coated turnbuckles. Provide new two-ply garden hose not less than ½" hose size, cut to required lengths to protect tree trunks from damage by wires.
- I. Gravel shall be water-worn, hard, durable gravel washed free of loam, sand or other foreign matter. Gravel shall be 1" minimum to 2 ½" maximum in size and shall be tan-beige to white in color.
- J. See Landscaping Plan for landscaping schedule, details and notes. Any other required landscaping materials shall be approved by the Architect.

## PART THREE – EXECUTION

### 3.1 SOIL PREPARATION OF AREAS TO BE PLANTED

- A. General Contractor shall redistribute stockpiled topsoil as directed by Architect. The Landscaping Contractor will be required to fine grade and loosen the topsoil in all areas to

be planted. Loosening the topsoil shall be done with a harrow or similar equipment. Remove all stones, roots, rubbish and other undesirable material by the use of a hand rake.

- B. Prepared planting soil mixture for trees, shrubs and plants shall consist of 25% peat humus, 25% cow manure and 50% topsoil thoroughly mixed.
- C. Excavate pits for trees. Excavations shall have vertical sides and with bottom slightly raised at center to provide proper drainage. Excavations shall be twice the diameter of the balls and not less than six inches deeper. The hard subsoil in the bottom of excavations filled with water and allowed to percolate out before planting. Excavated subsoil shall not be used to backfill in planting operation.

### 3.2 PLANTING

- A. Trees shall be set on a layer of prepared planting soil mixture. After plumbing and centering in hole, additional backfill of prepared mixture shall be placed in layers and worked to eliminate voids and air pockets. When hole is approximately 2/3 full, it shall be filled with water until no more is absorbed. After placing final layer of backfill, it shall be watered again. A berm of topsoil shall be built around edge of excavation to form a shallow saucer to collect water. All trees shall be guyed and staked to maintain upright position.
- B. Grass sod shall be planted in areas indicated on the drawings. After lawn area has been properly prepared by grading, loosening, raking and watering, grass sod strips or blocks shall be laid with tight joints. After laying, sod shall be rolled or lightly tamped and again watered thoroughly.

### 3.3 MAINTENANCE

- A. All landscaping work shall be maintained by the Contractor for 30 days after final acceptance of the entire project by the Owner.
- B. Maintenance of landscaping shall consist of but not limited to the following:
  - 1. Pruning, cultivating, weeding and watering as required for healthy growth.
  - 2. Restoring planting saucers and mulch.
  - 3. Tightening and repairing stakes and guy supports.
  - 4. Resetting trees to proper grades and vertical positions as required.
  - 5. Spraying trees, shrubs and grass as required to prevent disease and insects.
  - 6. Replacing dead or damaged trees and grass.

### 3.4 CLEAN-UP AND PROTECTION

- A. During landscape work, materials and equipment shall be stored where directed. Pavement shall be kept clean and work areas shall be in an orderly condition.
- B. Landscape work and materials shall be protected from damage due to landscape operations and operations by other contractors and trades. Protections shall be maintained until final acceptance. All damaged landscape work shall be treated, repaired or replaced.

### 3.5 INSPECTION AND ACCEPTANCE

- A. When the landscape work is completed, the Architect shall, upon request, make an inspection to determine acceptability.
- B. Where inspected work does not comply with the requirements, the rejected work shall be replaced and specified maintenance continued until reinspected by the Architect and found to be acceptable. All rejected trees and materials shall be promptly removed from the site and replaced.
- C. Upon acceptance, the landscape contractor shall submit three copies of typewritten instructions and recommended procedures to be established by the Owner for the maintenance of the landscape work.

END OF SECTION

## SECTION 03300 - CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Footings.
  - 2. Foundation walls.
  - 3. Slabs-on-grade.
  - 4. Suspended slabs.
- B. Related Sections include the following:
  - 1. Division 2 Section "Earthwork" for drainage fill under slabs-on-grade.
  - 2. Division 2 Section "Cement Concrete Pavement" for concrete pavement and walks.

#### 1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with fly ash.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Indicate amounts of mixing water to be withheld for later addition at Project site.
- D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
  - 1. Aggregates.
- F. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Cementitious materials.

2. Admixtures.
3. Form materials and form-release agents.
4. Curing compounds.
5. Floor and slab treatments.

G. Field quality-control test reports.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities".
- C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
  1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
  2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code - Reinforcing Steel."
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
  2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
  1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

- a. Contractor's superintendent.
  - b. Independent testing agency responsible for concrete design mixtures.
  - c. Ready-mix concrete manufacturer.
  - d. Concrete subcontractor.
2. Review testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semi-rigid joint fillers, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, and concrete protection.

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

## PART TWO – PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  2. Products: Subject to compliance with requirements, provide one of the product specified.
  3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work including, but are not limited to, manufacturers specified.
  4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

### 2.2 FORM-FACING MATERIAL

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
  1. Plywood, metal or other approved panel materials.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
  1. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.



- C. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
  - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
  - 3. Furnish ties with integral water-barrier plates to walls indicated to receive damp-proofing or waterproofing.

## 2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 82, galvanized.
- C. Galvanized-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from galvanized steel wire into flat sheets.

## 2.4 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.

## 2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I, gray. Supplement with the following:
    - a. Fly Ash: ASTM C 618, Class C or F.
- B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source.
  - 1. Maximum Coarse-Aggregate Size: (Per Structural Mix Design parameters.)
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

## 2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.

- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

- 1. Water-Reducing Admixture: ASTM C 494, Type A.

## 2.7 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397, not less than 6 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.
- B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

## 2.8 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
  - 1. Available Products:
    - a. Axim Concrete Technologies; Cimfilm.
    - b. Burke by Edoco; BurkeFilm.
    - c. ChemMasters; Spray-Film.
    - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
    - e. Dayton Superior Corporation; Sure Film.
    - f. Euclid Chemical Company (The); Eucobar.
    - g. Kaufman Products, Inc.; Vapor Aid.
    - h. Lambert Corporation; Lambco Skin.
    - i. L&M Construction Chemicals, Inc.; E-Con.
    - j. MBT Protection and Repair, Div. of ChemRex; Confilm.
    - k. Meadows, W. R., Inc.; Sealtight Evapre.
    - l. Metalcrete Industries; Waterhold.
    - m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
    - n. Sika Corporation, Inc.; SikaFilm.
    - o. Symons Corporation, a Dayton Superior Company; Finishing Aid.
    - p. Unitex; Pro-Film.
    - q. US Mix Products Company; US Spec Monofilm ER.
    - r. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Available Products:

- a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
- b. Burke by Edoco; Aqua Resin Cure.
- c. ChemMasters; Safe-Cure Clear.
- d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
- e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
- f. Euclid Chemical Company (The); Kurez DR VOX.
- g. Kaufman Products, Inc.; Thinfilm 420.
- h. Lambert Corporation; Aqua Kure-Clear.
- i. L&M Construction Chemicals, Inc.; L&M Cure R.
- j. Meadows, W. R., Inc.; 1100 Clear.
- k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
- l. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
- m. Tamms Industries, Inc.; Horncure WB 30.
- n. Unitex; Hydro Cure 309.
- o. US Mix Products Company; US Spec Maxcure Resin Clear.
- p. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

## 2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
  - 1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- D. Reglets: Fabricate reglets of not less than 0.0217-inch- thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- E. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

## 2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
  4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109.

## 2.11 CONCRETE MIXTURES - GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 20 percent max.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture in concrete, as required, for placement and workability.
  2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  3. Use water-reducing admixture in pumped concrete.

## 2.12 CONCRETE MIXTURE

- A. Footings and Slabs: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3000 psi at 28 days.
  2. Maximum Water-Cementitious Materials Ratio: 0.53.
  3. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 11/2-inch nominal maximum aggregate size.

## 2.13 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## 2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
  1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
  1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
  3. Provide batch ticket for each batch discharged and used in the work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

# PART THREE – EXECUTION

## 3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
  1. Class A, 1/8 inch for smooth-formed finished surfaces.
  2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.

- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  - 1. Install keyways, reglets, recesses, and the like, for easy removal. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

### 3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

#### 3.4 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
  1. Do not remove shoring or reshoring until measurement of slab tolerance is complete.
- B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

#### 3.5 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
  1. Lap joints 6 inches and seal with manufacturer's recommended tape.

#### 3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
  1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

### 3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  - 2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
  - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
  - 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

### 3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit



duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 2. Maintain reinforcement in position on chairs during concrete placement.
  - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  - 4. Slope surfaces uniformly to drains where required.
  - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When average high and low temperature is expected to fall below 40 degrees F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
  - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### 3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
  2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

### 3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of ¼ inch in 1 direction.
1. Apply scratch finish to surfaces indicated, to receive concrete floor toppings, and to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
  2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
    - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

### 3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

### 3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. Apply curing compound after finishing slab.

- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  - 1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
    - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
  - 2. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than ½ inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  2. After concrete has cured at least 14 days, correct high areas by grinding.
  3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of ¼ inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a ¾-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

- B. Inspections:
1. Verification of use of required design mixture.
  2. Concrete placement, including conveying and depositing.
  3. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
  2. Testing Frequency: Obtain at least one composite sample for each 50 cu. yd. or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  3. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  5. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
  6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  7. Compression Test Specimens: ASTM C 31.
    - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
  8. Compressive-Strength Tests: ASTM C 39; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.

- b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
- 9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- 10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- 11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- 12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- 13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.
- 14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 15. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION

## SECTION 04810 - UNIT MASONRY ASSEMBLIES

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Concrete brick.
3. Face brick.
4. Building (common) brick.
5. Mortar and grout.
6. Reinforcing steel.
7. Masonry joint reinforcement.
8. Ties and anchors.
9. Embedded flashing.
10. Miscellaneous masonry accessories.
11. Masonry-cell insulation.

- B. Related Sections include the following:

1. Division 7 Section "Bituminous Dampproofing" for dampproofing applied to cavity face of backup wythes of cavity walls.
2. Division 7 Section "Water Repellents" for water repellents applied to unit masonry assemblies.
3. Division 7 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
4. Division 7 Section "Joint Sealants" for sealing control and expansion joints in unit masonry.

- C. Products installed, but not furnished, under this Section include the following:

1. Steel lintels and shelf angles for unit masonry, furnished under Division 5 Section "Metal Fabrications."
2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim."
- 3.

#### 1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

#### 1.4 PERFORMANCE REQUIREMENTS



- A. Provide structural unit masonry that develops indicated net-area compressive strengths ( $f'_m$ ) at 28 days.
- B. Determine net-area compressive strength ( $f'_m$ ) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

## 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
  - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
  - 2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
  - 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection: For the following:
  - 1. Face brick, in the form of straps of five or more bricks.
  - 2. Colored mortar.
  - 3. Weep holes/vents.
- D. Samples for Verification: For each type and color of the following:
  - 1. Exposed concrete masonry units.
  - 2. Face brick.
  - 3. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.
  - 4. Weep holes/vents.
  - 5. Accessories embedded in masonry.
- E. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
  - 1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- F. Qualification Data: For testing agency.
- G. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
  - 1. Masonry units.

- a. Include material test reports substantiating compliance with requirements.
  - b. For bricks, include size-variation data verifying that actual range of sizes falls within specified tolerances.
  - c. For exposed brick, include material test report for efflorescence according to ASTM C 67.
  - d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
- 2. Cementitious materials. Include brand, type, and name of manufacturer.
- 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
- 4. Grout mixes. Include description of type and proportions of ingredients.
- 5. Reinforcing bars.
- 6. Joint reinforcement.
- 7. Anchors, ties, and metal accessories.
- H. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
  - 1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.
  - 2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- I. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- J. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

## 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

- E. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 60 inches long by 48 inches high by full thickness.
  2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
  3. Clean exposed faces of panels with masonry cleaner indicated.
  4. Protect approved sample panels from the elements with weather-resistant membrane.
  5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
    - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.8 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  2. Protect sills, ledges, and projections from mortar droppings.
  3. Protect surfaces of window and doorframes, as well as similar products with painted and integral finishes, from mortar droppings.
  4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1 /ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 degree F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## PART TWO - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  2. Products: Subject to compliance with requirements, provide one of the products specified.
  3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

## 2.2 MASONRY UNITS, GENERAL

- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

## 2.3 CONCRETE MASONRY UNITS (CMUs)

- A. Shapes: Provide shapes indicated and as follows:
  - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
  - 2. Provide square-edged units for outside corners, unless otherwise indicated.
- B. Concrete Masonry Units: ASTM C 90.
  - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi 2800 psi.
  - 2. Weight Classification: Normal weight.
  - 3. Size (8" AND 12"): Manufactured to dimensions 3/8 inch less than nominal dimensions.
  - 4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
- C. Concrete Building Brick: ASTM C 55.
  - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2500 psi.
  - 2. Weight Classification: Normal weight.
  - 3. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.

## 2.4 CONCRETE AND MASONRY LINTELS

- A. General: Provide concrete and masonry lintels, as indicated on the drawings, complying with requirements below.
- B. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Division 3 Section "Cast-in-Place Concrete."
- C. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

## 2.5 BRICK

- A. General: Provide shapes indicated and as follows:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
  2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
  3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
  4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Face Brick: Match existing. Provide face brick matching color range, texture and size of existing face brick.
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi.
  2. Size: Match size of face brick.
  3. Application: Use where brick is indicated for concealed locations. Face brick complying with requirements for grade, compressive strength, and size indicated for building brick may be substituted for building brick.

## 2.6 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated. Mortar color shall match existing.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.
- D. Masonry Cement: ASTM C 91.
1. Products:
    - a. Capital Materials Corporation; Flamingo Color Masonry Cement.
    - b. Lehigh Cement Company; Lehigh Masonry Cement.
    - c. National Cement Company, Inc.; Coosa Masonry Cement.
- E. Mortar Cement: ASTM C 1329.
1. Products:
    - a. Lafarge North America Inc.; Lafarge Mortar Cement or Magnolia Superbond Mortar Cement.

- F. Colored Cement Product: Packaged blend made from portland cement and lime masonry cement or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
  2. Pigments shall not exceed 10 percent of portland cement by weight.
  3. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
  4. Products:
    - a. Colored Portland Cement-Lime Mix:
      - 1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
      - 2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
      - 3) Lafarge North America Inc.; Eaglebond.
      - 4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
    - b. Colored Masonry Cement:
      - 1) Capital Materials Corporation; Flamingo Color Masonry Cement.
      - 2) Essroc, Italcementi Group; Brixment-in-Color.
      - 3) Holcim (US) Inc.; Rainbow Mortamix Custom Color Masonry Cement.
      - 4) Lafarge North America Inc.; Magnolia Masonry Cement.
      - 5) Lehigh Cement Company; Lehigh Custom Color Masonry Cement.
      - 6) National Cement Company, Inc.; Coosa Masonry Cement.
    - c. Colored Mortar Cement:
      - 1) Lafarge North America Inc.; Magnolia Superbond Mortar Cement.
- G. Aggregate for Mortar: ASTM C 144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
  2. For joints less than ¼ inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
  3. White-Mortar Aggregates: Natural white sand or crushed white stone.
  4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- H. Aggregate for Grout: ASTM C 404.

- I. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.
- J. Refractory Mortar Mix: Ground fireclay or non-water-soluble, calcium aluminate, medium-duty refractory mortar that passes ASTM C 199 test; or an equivalent product acceptable to authorities having jurisdiction.
- K. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
  - 1. Products:
    - a. Addiment Incorporated; Mortar Kick.
    - b. Euclid Chemical Company (The); Accelguard 80.
    - c. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
    - d. Sonneborn, Div. of ChemRex; Trimix-NCA.
- L. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
  - 1. Products:
    - a. Addiment Incorporated; Mortar Tite.
    - b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
    - c. Master Builders, Inc.; Color Cure Mortar Admix or Rheomix Rheopel.
- M. Water: Potable.

## 2.7 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Masonry Joint Reinforcement, General: ASTM A 951.
  - 1. Interior Walls: Hot-dip galvanized, carbon steel.
  - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
  - 3. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
  - 4. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
  - 5. Wire Size for Veneer Ties: W1.7 or 0.148-inch diameter.
  - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
  - 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- D. Masonry Joint Reinforcement for Multiwythe Masonry:



1. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate ties that extend into facing wythe. Ties have two hooks that engage eyes or slots in reinforcement and resist movement perpendicular to wall. Ties extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

## 2.8 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.
  1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 641/A 641M, Class 1 coating.
  2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
  3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
  4. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
  5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
  6. Stainless-Steel Sheet: ASTM A 666, Type 304.
  7. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
  8. Stainless Steel bars: ASTM A 276 or ASTM a 666, Type 304.
- B. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from steel sheet, galvanized after fabrication not less than 0.043 inch thick.
- C. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
- D. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
  1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.
  2. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
  3. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire.
- E. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
  1. Anchor Section for Welding to Steel Frame: Crimped ¼-inch- diameter, hot-dip galvanized steel wire.
  2. Tie Section for Steel Frame: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.188-inch- diameter, hot-dip galvanized steel wire.
  3. Connector Section for Concrete: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.053-inch- thick, steel sheet, galvanized after fabrication.

4. Tie Section for Concrete: Corrugated metal ties with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch of masonry face.
- F. Partition Top anchors: 0.097-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- G. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by ¼ inch thick by 24 inches long, with ends turned up 2 inches or with cross pins, unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

## 2.9 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.
- B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.
- C. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.
- D. Postinstalled Anchors: Provide chemical or torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
2. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

## 2.10 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing, where flashing exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
  1. Stainless Steel : ASTM A 240/A 240M, Type 304, 0.016 inch thick.
  2. Copper: ASTM B370, Temper H00 or H01, cold rolled copper sheet, 10-oz./sq. ft. weight or 0.0135 inch thick for fully concealed flashing; 16-oz./sq.ft. weight or 0.0216 inch thick elsewhere.
  3. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plate at joints of formed, smooth metal flashing.

4. Fabricate through-wall metal flashing embedded in masonry from copper, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
    - a. Products:
      - 1) Cheney Flashing Company; Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth).
      - 2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.
  5. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
  6. Fabricate through wall flashing with drip edge where indicated. Fabricate by extending flashing ½ inch out from all, with outer edge bent down 30 degrees and hemmed.
  7. Fabricate through wall flashing with sealant stop where indicated. Fabricate by bending metal back on itself ¾ inch at exterior face of wall and down into joint 3/8 to form a stop for retaining sealant backer rod.
  8. Fabricate metal drip edges and sealant strips for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked Seam. Form hem on upper surface of metal so that completed seam will she water.
  9. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches into wall and ½ inch out from wall, with outer edge bent down 30 degrees and hemmed.
  10. Metal Flashing Terminations: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for ¾ inch and down into joint 3/8 inch to form a stop for retaining sealant backer rod.
  11. Metal Expansion-Joint Strips: Fabricate from copper to shapes indicated.
- B. Flexible Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:
1. Copper-Laminated Flashing: 7-oz/sq.ft. copper sheet bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
    - a. Products:
      - 1) Advanced Building Products, Inc.; Copper Fabric Flashing.
      - 2) AFCO Products, Inc.; Copper Fabric.
      - 3) Hohmann and Barnard, Inc.; H & B C-Fab Covered Copper.
      - 4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
      - 5) Polyrite Manufacturing Corp.; Copper Fabric Flashing.

- 6) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
  - 7) York Manufacturing, Inc.; York Copper Fabric Flashing.
2. Asphalt-Coated Copper Flashing: 5-oz./sq.ft. copper sheet coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
- a. Products:
    - 1) Advanced Building Products, Inc.; Cop-R-Cote.
    - 2) AFCO Products, Inc.; Cop-A-Cote.
    - 3) Hohmann and Barnard, Inc.; H & B C-Coat Flashing.
    - 4) Phoenix Building Products; Type ACC-Asphalt Bituminous Coated.
    - 5) Polytime Manufacturing Corp.; Coated Copper Flashing.
    - 6) Sandell Manufacturing Co., Inc.; Coated Copper Flashing.
    - 7) York Manufacturing, Inc.; Copperseal.
3. Rubberized Asphalt Flashing: Composite flashing product consisting of a pliable adhesive rubberized-asphalt compound, bonded to a high-density, cross laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.
- a. Products:
    - 1) Advanced Building Products, Inc.; Peel-N-Seal
    - 2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing
    - 3) Dayton Superior Corporation, Dur-O-Wal Division: Dur-O-Barrier -44.
    - 4) Grace Construction Products, a unit of W. R. Grace & Co. – Conn.; Perm-A-Barrier Wall Flashing.
    - 5) Heckmann Building Products, Inc.; No 82 Rubberized-Asphalt Thru-Wall Flashing
    - 6) Hohmann & Barnard, Inc.; Testroflash
    - 7) Polyguard Products, Inc.; Polyguard 300
    - 8) Polytime Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
    - 9) Williams Products, Inc.; Everlastic MF-40
4. Elastomeric Thermoplastic Flashing: Composite Flashing product consisting of a polyester-reinforced ethylene interpolymer alloy as follows:
- a. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch thick.
  - b. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch thick with a 0.015-inch thick coat of rubberized-asphalt adhesive.
  - c. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch-thick coating of rubberized-asphalt adhesive. Where flashing extends to face of masonry, rubberized asphalt coating is held back approximately 1-1/2 inches from edge.

- d. Accessories: Provide preformed corners and dams, other special shapes, and seaming materials produced by flashing manufacturer.
  - e. Products:
    - 1) Hyload, Inc.; Hyload Cloaked Flashing System.
- 5. EPDM Flashing: Sheet flashing product made from ethylene diene terpolymer, complying with ASTM D 4637, 0.040 inch thick.
  - a. Products:
    - 1) Carlisle Coatings and Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing
    - 2) Firestone Building Products; Flash Guard.
    - 3) Heckmann Building Products, Inc.; No. 81 EPDM Thru-Wall Flashing.
- C. Solder and Sealants for Sheet Metal Flashings:
  - 1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.
  - 2. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
  - 3. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications, required to seal joints in sheet metal flashing and trim and remain watertight.
- D. Adhesives, primers, and Seam Tapes for Flashings: Flashing manufacturer's standard product or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

## 2.11 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep/Vent Products: Use one of the following, unless otherwise indicated:

1. Wicking Material: Absorbent rope, made from cotton or UV-resistant synthetic fiber, 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity between wythes. Use only for weeps.
2. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, 3/8-inch OD by 4 inches long.
3. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches long.
4. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
  - a. Products:
    - 1) Advanced Building Products Inc.; Mortar Maze weep vent.
    - 2) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
    - 3) Heckmann Building Products Inc.; No. 85 Cell Vent.
    - 4) Hohmann & Barnard, Inc.; Quadro-Vent.
    - 5) Wire-Bond; Cell Vent.

## 2.12 MASONRY-CELL INSULATION

- A. Masonry Cell Insulation shall be foamed-in-place masonry insulation equal to "Core-Fill 500" Manufactured by Tailored Chemical Products, Hickory, NC.

## 2.13 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
  1. Manufacturers:
    - b. Diedrich Technologies, Inc.
    - c. EaCo Chem, Inc.
    - d. ProSoCo, Inc.

## 2.14 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  1. Do not use calcium chloride in mortar or grout.
  2. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.

3. Limit cementitious materials in mortar for exterior and reinforced masonry to Portland cement, mortar cement, and lime.
  4. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. For masonry below grade or in contact with earth, use Type S.
  2. For reinforced masonry, use Type S.
  3. For mortar parge coats, use Type S or N.
  4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
  5. For interior non-load-bearing partitions, Type O may be used instead of Type N.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
1. Pigments shall not exceed 10 percent of portland cement by weight.
  2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
  3. Mix to match Architect's sample.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
1. Mix to match Architect's sample.
- F. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
  2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

## PART THREE - EXECUTION

### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

2. Verify that foundations are within tolerances specified.
  3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
1. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.
- H. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, ¼ inch in 20 feet, or ½ inch maximum.
  2. For vertical alignment of exposed head joints, do not vary from plumb by more than ¼ inch in 10 feet, or ½ inch maximum.
  3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, ¼ inch in 20 feet, or ½ inch maximum.



4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

### 3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide ½-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.
3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with fire resistive requirements.

### 3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and concrete masonry units as follows:
  1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
  3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
  4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

### 3.5 COMPOSITE MASONRY

- A. Bond wythes of composite masonry together using one of the following methods:
  1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 1.77 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
    - a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.

2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
  - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
  - b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
- B. Bond wythes of composite masonry together using bonding system indicated on Drawings.
- C. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.
  1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.
- D. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
  1. Provide individual metal ties not more than 16 inches o.c.
  2. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.
  3. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

### 3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
  1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 1.77 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
    - a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
    - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type ties to allow for differential movement regardless of whether bed joints align.
  2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
    - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
    - b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
    - c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.

3. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B. Bond wythes of cavity walls together using bonding system indicated on Drawings.
- C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- D. Parge cavity face of backup wythe in a single coat approximately 3/8 inch thick. Trowel face of parge coat smooth.
- E. Coat cavity face of backup wythe to comply with Division 7 Section "Bituminous Dampproofing."

### 3.8 MASONRY-CELL INSULATION

- A. General: Install foamed-in-place insulation from interior prior to installation of interior finish work and after all masonry and structural concrete work is in place; comply with manufacturer's instructions.
- B. Installation: Fill all open cells and voids in all exterior hollow concrete masonry walls. The foam insulation shall be pressure injected through a series of 5/8" to 7/8" holes drilled into every vertical column of block cells (every 8" on center) beginning at an approximate height of four (4) feet from finished floor level. Repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until the void is completely filled. Patch holes with mortar and score to resemble existing surface.

### 3.9 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  1. Space reinforcement not more than 16 inches o.c.
  2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
    - a. Reinforcement above is in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### 3.9 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
  - 1. Provide an open space not less than ½ inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
  - 2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
  - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

### 3.10 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
  - 1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
  - 2. Install preformed control-joint gaskets designed to fit standard sash block.
  - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
  - 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C. Form expansion joints in brick made from clay or shale as follows:
  - 1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
  - 2. Build flanges of factory-fabricated, expansion-joint units into masonry.
  - 3. Build in compressible joint fillers where indicated.
  - 4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants."

- D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants," but not less than 3/8 inch.
  - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

#### 9.11 LINTELS

- A. Install steel lintels where indicated.
- B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

#### 9.12 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows, unless otherwise indicated:
  - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  - 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within ½ inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
  - 3. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and 1-1/2 inches into the inner wythe. Form ¼-inch hook in edge of flashing embedded in inner wythe.
  - 4. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under building paper or building wrap, lapping at least 4 inches.
  - 5. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.

6. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.
  7. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.
  8. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing ½ inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
  9. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing ½ inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
  10. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
1. Use specified weep/vent products to form weep holes.
  2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
  3. Space weep holes 24 inches o.c., unless otherwise indicated.
  4. Space weep holes formed from plastic tubing or wicking material 16 inches o.c.
  5. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
  6. Trim wicking material flush with outside face of wall after mortar has set.
- E. Place pea gravel in cavities as soon as practical to a height equal to height of first course above top of flashing, but not less than 2 inches, to maintain drainage.
1. Fill cavities full height by placing pea gravel in cavities as masonry is laid so that at any point masonry does not extend more than 24 inches above top of pea gravel.
- F. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.
- G. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.
1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

#### 9.13 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
  - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
  - 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  - 2. Limit height of vertical grout pours to not more than 60 inches.

#### 9.14 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample wall panel; leave one-half of panel unclean for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.



5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
8. Clean stone trim to comply with stone supplier's written instructions.
9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

#### 9.15 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
  1. Crush masonry waste to less than 4 inches in each dimension.
  2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 2 Section "Earthwork."
  3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

## SECTION 05120 - STRUCTURAL STEEL

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Structural steel.
- B. Related Sections include the following:
  - 1. Division 1 Section Administrative Requirements.
  - 2. Division 9 painting Sections and Division 9 Section "High-Performance Coatings" for surface preparation and priming requirements.

#### 1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
  - 1. Include details of cuts, connections, splices, holes, and other pertinent data.
  - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
  - 3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
- C. Welding certificates:
- D. Qualification Data: For installer, fabricator, and testing agency.

#### 1.5 DELIVERY, STORAGE AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
  - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.

2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

## 1.6 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

## PART TWO – PRODUCTS

### 2.1 STRUCTURAL STEEL MATERIALS

- A. W-Shapes: ASTM A 992.
- B. Channels, Angles, M, S-Shapes: ASTM A 36.
- C. Plate and Bar: ASTM A 36.
- D. Welding Electrodes: Comply with AWS requirements.

### 2.2 BOLTS, CONNECTORS AND ANCHORS

- A. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
  1. Configuration: Straight.
  2. Nuts: ASTM A 563 heavy hex carbon steel.
  3. Plate Washers: ASTM A 36 carbon steel.
  4. Finish: Plain.
- B. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
  1. Nuts: ASTM A 563 heavy hex carbon steel.
  2. Plate Washers: ASTM A 36 carbon steel.
  3. Washers: ASTM F 436 hardened carbon steel.
  4. Finish: Plain.

### 2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

### 2.4 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings—Allowable Stress Design and Plastic Design."
  1. Mark and match-mark materials for field assembly.
  2. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
  - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- C. Bolt Holes: Drill or punch standard bolt holes perpendicular to metal surfaces.
- D. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."
- E. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
  - 1. Drill or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
  - 2. Base-Plate Holes: Drill or punch holes perpendicular to steel surfaces.
  - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

## 2.5 SHOP CONNECTIONS

- A. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
  - 1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
  - 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

## 2.6 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
  - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
  - 2. Surfaces to be field welded.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
  - 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

- D. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

## PART THREE - EXECUTION

### 3.1 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings—Allowable Stress Design and Plastic Design."
- B. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- C. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.

### 3.2 FIELD CONNECTIONS

- A. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
  - 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings—Allowable Stress Design and Plastic Design" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
  - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
  - 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

### 3.3 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
  - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
  - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

- C. Touch-up Painting: Cleaning and touchup painting are specified in Division 9 painting Sections.

END OF SECTION

## SECTION 05310 – NON-COMPOSITE METAL FLOOR DECKING

### PART ONE – GENERAL

#### 1.1 DESCRIPTION

- A. Work Included: Extent of metal decking is indicated on drawings, including basic layout and type of deck units required.
- B. Related Work Specified Elsewhere: Steel beams and joists are specified in another DIVISION 5 SECTION.

#### 1.2 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provision of the following codes and standards, except as otherwise indicated or specified.
  - 1. AISI "Specification for the Design of Cold-Formed Steel Structural Members".
  - 2. AWS D1.3 "Structural Welding Code" – Sheet Steel".
  - 3. SCE "Design Manual for Floor Decks and Roof Deck".
- B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS D1.1.
- C. Underwriter's Label: Provide metal floor deck units listed in Underwriter's Laboratories "Fire Resistance Directory", with each deck unit bearing the UL label and marking for specific system detailed.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to the following:

Composite Metal Floor Deck Units.  
Consolidated Systems, Inc.  
H.H. Robertson Company  
United Steel Deck, Inc.  
Vulcraft/Division Nucor Corporation  
Wheeling Corrugating Company

#### 1.3 SUBMITTALS

- A. Manufacturer's Data: Submit manufacturer's specifications and installation instructions for each type of decking and accessories. Include manufacturer's certification as may be required to show compliance with these specifications.
- B. Shop Drawings: Submit detailed drawings showing layout and types of deck panels, anchorage details and conditions requiring closure panels, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories. Reproduction of contract drawings for use as show drawings and erection drawings will not be permitted.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

- A. Steel for Galvanized Metal Deck Units: ASTM A611 Grade C.
- B. Miscellaneous Steel Shapes: ASTM A36
- C. Sheet Metal Accessories: ASTM A526, commercial quality, galvanized.
- D. Galvanizing: ASTM A653-95, G60
- E. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanize surface complying with Military Specification MIL-P-21035 (Ships).
- F. Flexible Closure Strips: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.

### 2.2 FABRICATION

- A. General: Form deck units in lengths to span three or more supports with flush butted ends and interlocking or nested side laps, unless otherwise indicated.
- B. Metal Cover Plates: Fabricate metal cover plates for end-abutting floor deck units of not less than same thickness as decking. Form to match contour of deck units and approximately 6" wide.
- C. Metal Closure Strips: Fabricate metal closure strips for openings between decking and other construction of not less than 0.045" min. (18 gauge) sheet steel. Form to provide tight-fitting closure at open ends of cells or flutes and sides of decking.

## PART 3 – EXECUTION

### 3.1 ERECTION

- A. General: Install deck units and accessories in accordance with manufacturer's recommendations and final shop drawings as specified herein.
  - 1. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.
  - 2. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at end of abutting units.
  - 3. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
  - 4. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- B. Fastening Deck Units:



1. Fasten floor deck units to steel supporting members by fusion welds using welding washers in strict accordance with manufacturer's instructions.
  2. Tack weld or use self-tapping No. 8 or larger machine screw at 4'-0" O.C. for fastening end closures.
  3. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds and methods used in correcting welding work.
  4. Mechanically fasten side laps of adjacent deck units between supports at intervals not exceeding 36" O.C. using self-tapping No. 8 or larger machine screws.
- C. Cutting and Fitting: Cut and nearly fit deck units and accessories around other work projecting through or adjacent to the decking as shown.
- D. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown.
- E. Hanger Slots or Clips: Provide UL approved punched hanger slots between cells or flutes of lower element where floor deck units are to receive hangers for support of ceiling construction, air ducts, diffusers, or lighting fixtures.
- F. Joint Covers: Provide metal joint covers abutting ends and changes in direction of floor deck units except where taped joints are required.
- G. Closure Strips: Provide metal closure strips at open uncovered end and edges of decking and in void between decking and other construction. Weld into position to provide a complete decking installation.
- H. Touch-Up Painting: After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.
1. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.
  2. In areas where shop-painted surfaces are to be exposed, apply touch-up paint to blend into adjacent surfaces.

END OF SECTION

## SECTION 05320 - STEEL ROOF DECK

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Roof deck.
- B. Related Sections include the following:
  - 1. Division 5 Section "Structural Steel"..
  - 2. Division 5 Section "Miscellaneous Metals and Metal Fabrication"
  - 3. Division 9 Section "Painting" for repair painting of painted deck.

#### 1.3 SUBMITTALS

- C. Product Data: For each type of deck, accessory, and product indicated.
- D. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.
- E. Product Certificates: Signed by steel deck manufacturers certifying that products furnished comply with requirements.
- F. Welding Certificates: Copies of certificates for welding procedures and personnel.
- G. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
  - 1. Mechanical fasteners.
- H. Research/Evaluation Reports: Evidence of steel deck's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

- B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- D. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those steel deck units tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
  - 2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
- E. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."
- F. FM Listing: Provide steel roof deck evaluated by FM and listed in FM's "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

#### 1.6 COORDINATION

- A. Coordinate installation of sound-absorbing insulation strips in topside ribs of acoustical deck with roofing installation specified in Division 7 to ensure protection of insulation strips against damage from effects of weather and other causes.

### PART TWO - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Steel Deck:
    - a. BHP Steel Building Products USA Inc.
    - b. Consolidated Systems, Inc.
    - c. Epic Metals Corp.
    - d. Marlyn Steel Products, Inc.
    - e. Nucor Corp.; Vulcraft Div.
    - f. Roof Deck, Inc.
    - g. United Steel Deck, Inc.

- h. Verco Manufacturing Co.
- i. Wheeling Corrugating Co.; Div. of Wheeling-Pittsburgh Steel Corp.

## 2.2 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 29, and the following:
  - 1. Galvanized Steel Sheet: ASTM A 653, Structural Steel (SS), Grade 33, G90 zinc coating.
  - 2. Deck Profile: Type WR, wide rib.
  - 3. Profile Depth: 1-1/2 inches.
  - 4. Design Uncoated-Steel Thickness: 0.0295 inch.
  - 5. Span Condition: As indicated.
  - 6. Side Laps: Overlapped.

## 2.3 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.
- I. Galvanizing Repair Paint: ASTM A 780, with dry film containing a minimum of 94 percent zinc dust by weight.
- J. Repair Paint: Lead- and chromate-free rust-inhibitive primer complying with performance requirements of FS TT-P-664.

## PART THREE - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

### 3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate decking bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
  - 1. Align cellular deck panels for entire length of cell runs and align cells at ends of abutting panels.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners shall be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions and per fastening diagrams indicated on Structural Contract Drawings.

### 3.3 ROOF DECK INSTALLATION

- A. Fasten roof deck panels to steel supporting members with #12 self-drilling carbon steel screws at spacing indicated.
- B. Side-Lap Fastening: Fasten side laps of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 24 inches on-center, and as follows:
  - 1. Mechanically fasten with self-drilling No. 10 diameter or larger carbon-steel screws.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof decking and screw flanges to top of deck. Space screws not more than 12 inches apart with at least 1 screw at each corner.
- E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to deck manufacturer's written instructions. Screw to substrate to provide a complete deck installation.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

#### 3.4 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

## SECTION 05400 - COLD-FORMED METAL FRAMING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Exterior non-load-bearing curtain-wall framing.
  - 2. Roof trusses.
  - 3. Gypsum sheathing and air-infiltration barriers.
- B. Related Sections include the following:
  - 1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.

#### 1.3 DEFINITIONS

- A. Minimum Uncoated Steel Thickness: Minimum uncoated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.
- B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
  - 1. Design Loads: As indicated.
  - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Exterior Non-Load-Bearing Curtain-Wall Framing: Horizontal deflection of 1/240 of the wall height under wind loading for roof live load.
    - b. Roof Trusses: Vertical deflection of 1/240 of the span.
  - 3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
  - a. Upward and downward movement of ½ inch.
- B. Design exterior non-load-bearing curtain-wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Design roof trusses according to AISI's "Design Guide for Cold-Formed Steel Trusses."

#### 1.5 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.
  1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements.
- D. Welding Certificates: Copies of certificates for welding procedures and personnel.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
  1. Expansion anchors.
  2. Power-actuated anchors.
  3. Mechanical fasteners.
  4. Miscellaneous structural clips and accessories.
- G. Research/Evaluation Reports: Evidence of cold-formed metal framings compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

#### 1.6 QUALITY ASSURANCE



- A. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Engineering Responsibility: Engage a qualified professional engineer to prepare design calculations, Shop Drawings, and other structural data.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- D. Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and galvanized-coating thickness.
- E. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- F. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code— Steel," and AWS D1.3, "Structural Welding Code—Sheet Steel."
- G. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," or by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
- H. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing.
  - 1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

## PART TWO - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

1. Allied American Studco, Inc.
2. Angeles Metal Systems.
3. California Expanded Metal Products Co.
4. California Metal Systems, Inc.
5. Clark Steel Framing Industries.
6. Consolidated Fabricators Corp.
7. Consolidated Systems, Inc.
8. Dale Industries, Inc.
9. Design Shapes in Steel.
10. Dietrich Industries, Inc.
11. Knorr Steel Framing Systems.
12. MarinoWare; Div. of Ware Industries, Inc.
13. Scafco Corp.
14. Steel Construction Systems.
15. Steel Developers, LLC.
16. Steeler, Inc.
17. Studco of Hawaii, Inc.
18. Super Stud Building Products, Inc.
19. Unimast, Inc.
20. United Metal Products, Inc.
21. Western Metal Lath.

### 2.2 MATERIALS

- A. Steel Sheet: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 33, Class 1 or 2.
2. Coating: G60.

### 2.3 NON-LOAD BEARING CURTAIN-WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: 0.0478 inch.
2. Flange Width: 1-5/8 inches.

- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges complying with ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: 0.0478 inch.
2. Flange Width: 1-1/4 inches.

## 2.4 ROOF TRUSSES

- A. Roof Truss Members: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, complying with ASTM C 955, and as follows:
  - 1. Minimum Uncoated-Steel Thickness: 0.0428 inch.
  - 2. Flange Width: 1-5/8 inches, minimum.

## 2.5 ROOF-RAFTER FRAMING

- A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, complying with ASTM C 955, and as follows:
  - 1. Minimum Uncoated-Steel Thickness: 0.0478 inch except bottom chord members shall be minimum 0.0598.
  - 2. Flange Width: 1-5/8 inches, minimum.
- B. Built-up Members: Built-up members of manufacturer's standard C-shaped steel section, with stiffened flanges, nested into a U-shaped steel section joist track, with unstiffened flanges; unpunched; of web depths indicated; complying with ASTM C 955, and as follows:
  - 1. Minimum Uncoated-Steel Thickness: 0.0478 inch.
  - 2. Flange Width: 1-5/8 inches, minimum.

## 2.6 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories of the same material and finish used for framing members, with minimum yield strength of 33,000 psi.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
  - 1. Supplementary framing.
  - 2. Bracing, bridging, and solid blocking.
  - 3. Web stiffeners.
  - 4. Gusset plates.
  - 5. Hole reinforcing plates.
  - 6. Backer plates.

## 2.7 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.
  - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

## 2.9 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.

## 2.10 GYPSUM SHEATHING

- A. Sheathing: Comply with requirements in Division 9 Section "Gypsum Sheathing."
- B. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M.
  - 1. Type and Thickness: Regular, ½ inch thick.
  - 2. Type and Thickness: Type X, 5/8 inch thick.
  - 3. Size: 48 by 96 inches, 48 by 108 inches or 48 by 120 inches as required.
  - 4. Available Product: Subject to compliance with requirements, a product that may be incorporated into the Work includes, but is not limited to, "Dens-Glass Gold" by Georgia-Pacific Corp.
  - 5. Product: Subject to compliance with requirements, provide "Dens-Glass Gold" by Georgia-Pacific Corp.

## 2.11 SHEATHING ACCESSORIES

- A. Air-Infiltration Barrier: Proprietary building wrap with flame-spread and smoke-developed ratings of less than 25 and 450, respectively, when tested according to ASTM E 84. Provide one of the following products:
  - 1. Polyethylene sheet; 0.0038 to 0.0064 inch thick; formed by spinning continuous strands of fine, high-density-polyethylene interconnected fibers and bonding them together by heat and pressure; incorporating an additive to provide ultraviolet light resistance for up to 120 days; and with a water-vapor transmission rate equaling 535 g through 1 sq. m of surface in 24 hours according to ASTM E 96, Desiccant Method (Method A).

- a. Product: Subject to compliance with requirements, provide "Tyvek Housewrap" by DuPont Company.
  2. Polypropylene sheet; 0.0115 inch thick; consisting of spun-bonded polypropylene substrate with a polypropylene coating attached directly to one side; and with a water-vapor transmission rate equaling 125 g through 1 sq. m of surface in 24 hours according to ASTM E 96, Desiccant Method (Method A).
    - a. Product: Subject to compliance with requirements, provide "Tygar HouseWrap" by Reemay, Inc.
  3. Laminated polyethylene sheet; 0.003 inch thick; consisting of 2 plies of microperforated, cross-laminated, high-density-polyethylene sheet; and with a water-vapor transmission rate equaling 125 g through 1 sq. m of surface in 24 hours according to ASTM E 96, Desiccant Method (Method A).
    - a. Product: Subject to compliance with requirements, provide "Rufco-Wrap" by Raven Industries, Inc.
  4. Woven polyolefin sheet; 0.005 inch thick; with a water-vapor transmission rate equaling 63 g through 1 sq. m of surface in 24 hours according to ASTM E 96, Desiccant Method (Method A).
    - a. Product: Subject to compliance with requirements, provide "Barricade Building Wrap" by Anthony Industries; Simplex Products Division.
- B. Fasteners: Steel drill screws, ASTM C 954, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
- C. Silicone Emulsion Sealant for Glass-Mat Gypsum Sheathing: Product complying with ASTM C 834, compatible with sheathing tape and gypsum sheathing, recommended by sheathing and tape manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
  1. Product: Subject to compliance with requirements, provide "Elmer's Siliconized Acrylic Latex Caulk" by Borden, Inc.
- D. Glass-Fiber Sheathing Tape for Glass-Mat Gypsum Sheathing: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads per inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board and with a history of successful in-service use.
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Perma-Tite Tape—PGM 207A; PermaGlas-Mesh, Inc.
    - b. Quik-Tape; Quik-Tape, Inc.

## 2.12 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
  - 1. Fabricate framing assemblies using jigs or templates.
  - 2. Cut framing members by sawing or shearing; do not torch cut.
  - 3. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
  - 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

## PART THREE - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- B. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled except all roof trusses shall be shop assembled.
- C. Install cold-formed metal framing according to ASTM C 1007, unless more stringent requirements are indicated.
- D. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- E. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.
1. Cut framing members by sawing or shearing; do not torch cut.
  2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
- F. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
- G. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- H. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- I. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- J. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- K. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

#### 3.4 NON-LOAD-BEARING CURTAIN-WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
2. Stud Spacing: 16 inches.

- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
  - 1. install single deep-leg deflection tracks and anchor to building structure.
  - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
  - 3. Connect vertical deflection clips to infill studs and anchor to primary building structure.
- E. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Shop Drawings but not more than 54 inches apart. Fasten at each stud intersection.
  - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
    - a. Install solid blocking at every other stud.
  - 2. Bridging: Cold-rolled steel channel welded or mechanically fastened to webs of punched studs.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

### 3.5 TRUSS INSTALLATION

- A. Install, bridge, and brace trusses according to Shop Drawings and requirements in this Section.
- B. Truss Spacing: 48 inches.
- C. Do not alter, cut, or remove framing members or connections of trusses.
- D. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.
- E. Erect trusses without damaging framing members or connections.
- F. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings.

### 3.6 GYPSUM SHEATHING INSTALLATION

- A. General: Install gypsum sheathing to comply with GA-253 and manufacturer's written instructions.



- B. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8-inch setback where non-load-bearing construction abuts structural elements.
- C. Coordinate sheathing installation with flashing and joint sealant installation so these materials are installed in the sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.
- D. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.
- E. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.
- F. Horizontal Installation: Install 24-inch wide gypsum sheathing boards horizontally with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of stud flanges and stagger end joints of adjacent boards not less than one stud spacing. Screw-attach boards at perimeter and within field of board to each steel stud at approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
- G. Vertical Installation: Install 48-inch- wide gypsum sheathing boards vertically with vertical edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjacent boards. Screw-attach boards at perimeter and within field of board to each steel stud at approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
- H. Air-Infiltration Barrier Application: Cover sheathing with air-infiltration barrier as follows:
  - 1. Cut back air-infiltration barrier 1/2 inch on each side of break in supporting members at expansion- or control-joint locations.
  - 2. Apply asphalt-saturated organic felt horizontally with 2-inch overlap and 6-inch end lap; fasten to sheathing with corrosion-resistant staples.
  - 3. Apply proprietary building wrap to comply with manufacturer's written installation instructions.
  - 4. Apply air-infiltration barrier to cover vertical flashing with 4-inch overlap.
- I. Sealing Sheathing Joints: Seal joints according to sheathing manufacturer's written recommendations and as follows:
  - 1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone emulsion sealant to embed sealant in entire face of tape. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

### 3.7 FIELD QUALITY CONTROL

- A. Testing: Contractor will engage a qualified independent testing agency to perform field quality-control testing.
- B. Field and shop welds will be subject to inspection and testing.

- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace Work that does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

### 3.8 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing. Paint framing surfaces with same type of shop paint used on adjacent surfaces.
- C. Protect paper-surfaced gypsum sheathing that will be exposed to weather for more than 30 days by covering exposed exterior surface of sheathing with a securely fastened air-infiltration barrier. Apply covering immediately after sheathing is installed.
- D. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.
- E. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

## SECTION 05420 – STEEL JOISTS

### 1. RELATED DOCUMENTS

- 1.1 The General Provisions of the Contract, including Division 1, General Requirements, apply to the work specified in this Section.

### 2. GENERAL REQUIREMENTS

- 2.1 Description of Work: Include all open web steel joists complete with bridging, extensions, anchors and other incidentals required to satisfactorily complete the steel joist work as indicated on the drawings and as specified herein.
- 2.2 Related Work: Structural steel, metal decking and miscellaneous metals are specified in other sections.
- 2.3 Quality Assurance: Welding to be performed by certified welder meeting the requirements of AWS D1.1.
- 2.4 Submittals:
  - 1. Shop Drawings: Showing layout, fabrication and erection details and anchorage.
  - 2. Certification: That joists are manufactured by a member of the Steel Joist Institute (SJI) and conform to all requirements of SJI Specifications.
  - 3. Design Computations when requested in conformance with AISC "Load Tables and Standard Specifications.
- 2.5 Product Handling: Deliver, handle and store joists to prevent damage or distortion. Keep off ground in a dry location.

### 3. MATERIALS

- 3.1 Joists: Shall be a "K" Series, as shown. Material design, manufacturing connection, test, camber and accessories shall be in accordance with the Standard Specifications for open Web Joists K-Series, adopted by the SJI, Current edition. Provide extensions where indicated.
- 3.2 Shop Painting: Joist to be cleaned and given a coat of primer standard with joist manufacturer. Remove all scale, rust and other detrimental material before coating.
- 3.3 All bridging anchors and other incidentals shall be appropriate to the joist and comply with all codes and standards specified herein.

### 4. ERECTION

- 4.1 Erection, handling, bridging and anchorage shall comply to SJI Standard Specifications. End joists shall be anchored to adjacent walls at each line of bridging.
- 4.2 Field welding shall be in accordance with AWS D1.1 and with requirements stated herein. Weld joist to steel supports with two 1/8 inch fillet welds 2-inches long.

- 4.3 Joists shall be secured in place, welded and anchored and bridging installed prior to receiving any construction loads. Coordinate joists location with access spaces and fixture locations for other trades. Prior to decking application, joists shall be adequately braced in accordance with steel deck manufacturer's recommendations. Bracing shall be approved before any decking or other loading is applied.
- 4.4 Bottom chord extensions shall be provided for all ceilings. Top extension required where shown.
- 4.5 Shop coats shall be touch-up wherever abraded by brushing with steel wire brush and coating with same material as used for shop coat.
- 4.6 Grout joists into masonry where required or use government anchors.

END OF SECTION

## SECTION 05500 - MISCELLANEOUS METALS AND METAL FABRICATION

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the contract, including Division 1, General Requirements, apply to the work specified in this Section.

#### 1.2 DESCRIPTION OF WORK

- A. This work shall include all miscellaneous metals and metal fabrication work required to satisfactorily complete the work indicated on the drawings and as specified herein. Items required shall not be assumed to be limited to those listed in these specifications.

#### 1.3 QUALITY ASSURANCE

- A. This work shall comply with the appropriate provisions of the following codes, standards and specifications except where noted otherwise:
  - 1. ASIC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" including "Commentary of the ASIC Specifications"
  - 2. ASIC "Specifications for the Design of Cold-Formed Steel Structural Members"
  - 3. AWS "Structural Welding Code"
  - 4. AWS "Standard Qualification Procedure"
  - 5. Structural Steel, ASTM A-36
  - 6. Structural Steel Tubing, ASTM A-500 - Grade B
  - 7. High-strength low-alloy structural manganese vanadium steel, ASTM A-441
  - 8. High-strength low-alloy structural steel, ASTM A242
  - 9. Flat rolled carbon steel sheets of structural quality, ASTM A-245
  - 10. Hot rolled carbon steel strip of structural quality, ASTM A-303
  - 11. High-strength low-alloy hot rolled steel sheets and strip, ASTM A-375
  - 12. High-strength bolts, ASTM A-325

#### 1.4 SUBMITTALS

- A. Manufacturer's data shall be submitted (for information only) for all products used in the miscellaneous metals and metal fabrication work. Data shall include manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions.

- B. Shop drawings shall be submitted (for review) for all assemblies and fabrication of miscellaneous metals which are not covered by manufacturer's data submittal. Shop drawings shall include field dimensions where possible. Shop drawings shall show plans, elevations, and accessory items. Setting drawings, templates and installation instructions shall be included.

## PART TWO - PRODUCTS

### 2.1 MATERIALS

- A. Stock materials, patterns, products or fabricated items of manufacturer's meeting the general requirements of the work and these specifications will be acceptable as approved by the Architect.
- B. For the fabrications of miscellaneous metal work which will be exposed to view, only materials which are smooth and free from surface used. Work shall be true to line and level with accurate angles and surfaces and straight sharp edges. Welds shall be continuous and in accordance with the recommendations of AS. All exposed welds shall be ground smooth and flush to match and blend with adjoining surfaces. Concealed fasteners shall be used whenever possible.
- C. Zinc-coated fasteners shall be provided with galvanized finish complying with ASTM A-153 for all exterior use or where built into an exterior wall. Fasteners shall be of the type, grade and class required for the installation of miscellaneous metal items.
- D. Miscellaneous structural shapes shall conform to ASTM A-36, high strength bolts to ASTM A-325 and anchor bolts to ASTM A-307.
- E. Concrete inserts shall be galvanized malleable iron complying to ASTM A-47 or hot-dip galvanized cast steel complying to ASTM A-27 of the appropriate size and shape casting required for the use intended.
- F. Where not specifically noted, all miscellaneous metal items shall be of the size, type, grade and class to provide adequate strength and durability for intended use.
- G. All miscellaneous metal work except those members or portion of members to be embedded in concrete or masonry and except those which are galvanized, stainless steel or aluminum shall be shop painted with one coat of shop primer. Any surface which will not be accessible after assembly or erection shall be shop painted with two coats. Shop primer shall be Tnemec #99 or an approved equal.

### 2.2 STEEL LINTELS, MISCELLANEOUS FRAMING AND SUPPORTS

- A. Steel lintels and miscellaneous framing and supports, which are not part of the structural steel but are required to complete the work, shall be furnished. Units shall be fabricated to the size, shape and profile shown or, if not show, of the required dimensions to receive other work. Lintels shall not have less than 8" bearing at each side of openings.
- B. Units shall be fabricated from structural steel shapes, plates and bars of all welded construction using a minimum number of joints for field connection. Units shall have integrally welded anchors where required for building into masonry.

- C. Units shall be cut, fitted and tapped to received hardware and similar items and shall be shop primed as noted above.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. All miscellaneous metal items shall be set accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Manufacturer's instructions shall be strictly followed. Items shall be securely anchored as shown or as required for the intended use. Concealed anchors shall be used whenever possible.
- B. All prime coats shall be touched-up after installation.

END OF SECTION

## SECTION 06100 - ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 1 Specification Sections, apply to work of this section.

#### 1.2 DESCRIPTION OF WORK

- A. Definition: Rough carpentry is work not specified as part of other sections and which is generally not exposed, except as otherwise indicated.
- B. Types of work in this section include rough carpentry for:
  - 1. Wood framing
  - 2. Wood grounds, nailers and blocking
  - 3. Wood furring
- C. Finish carpentry is specified in Section 06200. Prefabricated wood trusses are specified in Section 06176

#### 1.3 SUBMITTALS

- A. Wood Treatment Data: Comply with chemical treatment manufacturer's instructions for handling, storing, installation and finishing if treated material. Submit the following when requested by Architect.
  - 1. Preservation Treatment: For each type specified, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained and conformance with applicable standards.
    - a. For water-borne treatment include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site.

#### 1.4 PRODUCTION HANDLING

- A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar material.
  - 1. For lumber and plywood pressure treated with waterborne chemicals, sticker between each course to provide air circulation.

#### 1.5 PROJECT CONDITIONS

- A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailer, blocking, grounds, and similar supports to allow attachment of other work.



## PART 2 - PRODUCTS

### 2.1 LUMBER - GENERAL

- A. Lumber Standards: Manufacture lumber to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
- B. Grade Stamps: Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying agency, grade, species, moisture content at time of surfacing, and mill.
  - 1. For exposed lumber apply grade stamps to ends or back of each piece, or omit grade stamps entirely and issue certificate of grade compliance from inspection agency in lieu of grade stamp.
- C. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.
  - 1. Provide dressed lumber, S4S, unless otherwise indicated.
  - 2. Provide seasoned lumber with 15% maximum moisture content at time of dressing shipment for sizes 2" or less in nominal thickness, unless otherwise indicated.

### 2.2 DIMENSION LUMBER

- A. For structural light framing (2" to 4" thick, 2" to 6" wide), provide No. 2 grade of same species indicated for Structural Framing below.
- B. For structural framing (2" to 4" thick, over 6" wide), provide the following grade and species:
  - 1. Southern Pine graded under SPIB rules, No. 2 grade.
  - 2. Douglas Fir graded and WCLIB or WWPB rules, Select Structural Grade.
  - 3. Spruce-Pine-Fir graded under NLGA rules, select structural grade.

### 2.3 BOARDS

- A. Exposed Boards: Where boards will be exposed in the finished work, provide moisture content of 15% maximum, S-Dry".
  - 1. Where transparent or natural finish or no finish is indicated, provide Redwood, Select Heart Grade (RIS).
  - 2. Where painted finish is indicated, provide Southern Pine, No. 2 Boards per SPIB, or Douglas Fir Construction Boards per WCLIB or WWPB rules.
- B. Concealed Boards: Where boards will be concealed by other work, Provide lumber of 15% maximum moisture content (S-DRY) and of following species and grade:

1. Redwood Construction Common per RIS rules, Southern Pine No. 2 Boards per SPIB rules, or any species graded Construction Boards per WCLIB or WWPA rules.

C. Board Sizes: Provide as indicated on drawings.

#### 2.4 MISCELLANEOUS LUMBER

- A. Provide wood for support or attachment of other work including cant strips, bucks, nailers, blocking, furring grounds, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown and as follows.
- B. Moisture Content: 19% maximum for lumber items not specified to receive wood preservative treatment.
- C. Grade: Standard grade light framing size lumber of any species or board size lumber as required. No. 3 Common or Standard grade boards per WCLIB or WWPA rules or No. 3 boards per SPIB rules.

#### 2.5 MISCELLANEOUS

- A. Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers, and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.
  1. Where rough carpentry work is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating.
- B. Moisture Barrier: Tri-Flex 30 manufactured by Flexia Corp. or approved equal.

#### 2.6 WOOD TREATMENT BY PRESSURE PROCESS

- A. Preservative Treatment: Where lumber or plywood is indicated as TRT-Wd" or "T Treated", or is specified herein to be treated, comply with applicable requirements of AWPB Standards C2 (lumber) and C9 (Plywood) and AWPB standards listed below. Mark each treated item with the AWPB Quality Mark Requirements.
  1. Pressure-treat above-ground items with water-borne preservatives to comply with AWPB LP-2. After treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19% and 15%. Treat indicated items and the following:
    - a. Wood cants, nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing.
    - b. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.

2. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, Coast cut surfaces with heavy brush coat of same chemical used for treatment and to comply with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
- B. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

## PART 3 - EXECUTION

### 3.1 INSTALLATION - GENERAL

- A. Discard units of material with defects that might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.
- B. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.
- C. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards.
- D. Countersink nail heads on exposed carpentry work and fill holes.
- E. Use common wire nails, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish material. Make tight connections between members. Install fasteners without splitting wood; pre-drill as required.

### 3.2 WOOD GROUNDS, NAILERS, BLOCKING AND SLEEPERS

- A. Provide wherever shown and where required for screening or attachment work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
- B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.
- C. Provide permanent grounds of dresses, preservative treated, key-beveled lumber not less than 1-1/2" wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

### 3.3 WOOD FURRING

- A. Install plumb and level closure strips edges and openings. Shim with wood as required for tolerance of finish work.

### 3.4 WOOD FRAMING GENERAL

- A. Provide framing members of sizes and spacing shown, and frame openings as shown, or if not shown, comply with recommendation of "Manual for House Framing" of National Forest Products Association (N.F.P.A.) Do not splice structural members between supports.

- B. Anchor and nail as shown, and to comply with " Recommended Nailing Schedule" of the "1988 manual for Wood Framed Construction" of the American Forest Products Association."

END OF SECTION

## SECTION 06200 - FINISH CARPENTRY AND MILLWORK

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provision of the contract, including Division 1, General Requirements, applies to the work specified in this section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered by this section consists of furnishing and installation of finish carpentry, millwork and related items as indicated on the drawings as specified herein.
- B. The following items of related work are specified and included in other sections of these specifications:
  - 1. Rough Carpentry - Section 06100

#### 1.3 SUBMITTALS

- A. The Contractor shall furnish manufacturer's data, specifications, guarantee, test reports, samples, shop drawings, material certification, installation instructions and any other information which may be required to insure compliance with these specifications.
- B. Millwork Contractor shall submit for Architects review, 5 sets of millwork shop drawings. Shop drawings shall include plans, elevations and construction details of all millwork, including shelving. Sample of hardware shall be submitted upon request.

### PART 2 - PRODUCTS

#### 2.1 GENERAL INSTRUCTIONS

- A. All workmanship and materials shall be of the best of their respective kinds. All materials used in finish work shall be clear, free of cracks, checks, knots and other imperfections that may interfere with the proper and satisfactory completion, appearance and serviceability of the work. Any warped or otherwise imperfect work shall be removed and replaced. All work shall be done in a workmanlike manner in accordance with the best trade practices.
- B. Contractor shall install blocking in walls, ceilings and other framing as required to anchor hardware, accessories, specialty items, etc. Exact location and size of blocking shall be coordinated with appropriate supplier/installer. All blocking shall be No. 2 Southern Yellow Pine or an approved equal.
- C. Plastic laminate shall be equal to Nevamar. All plastic laminate shall be horizontal, General Purpose Standard Grande (GS-120) - .050" thick except where otherwise noted.
- D. All exterior wood trim shall be finger joint clear redwood or cedar. Trim shall be primed on all sides prior to installation.

## 2.2 GENERAL MILLWORK REQUIREMENTS

- A. All millwork shall be plastic laminate casework as shown on the drawings. All casework shall comply with industry standards.
- B. Sub-tops, sides, and bottoms shall be constructed of 3/4" industrial grade particle board with a thermally fused melamine coating on all semi-exposed surfaces. Exterior surfaces shall be covered with vertical grade plastic laminate. All exposed edges shall be covered with purified PVC, 1mm thickness, color to match exterior surfaces.
- C. Tops and splashes shall be constructed of 3/4" industrial grade particle board and exposed surface shall be covered with horizontal grade plastic laminate.
- D. All shelves shall be adjustable and shall be constructed of 3/4" industrial grade particle board with a thermally fused melamine coating on both surfaces, color to match interior of case. Exposed edges shall be covered with purified PVC, color to match interior of case.
- E. Backs shall be 1/4" hardboard with thermally fused melamine coating on the exposed surface, color to match the interior of the case.
- F. 5mm holes shall be drilled at 32mm on center, with plastic coated steel pins as shelf supports.
- G. Drawer guides shall be Grass America #6036 system.
- H. Pencil drawers shall be Grass America #6035 system.
- I. All hinges shall be Grass America 1006, self-closing, fully concealed hinges, with the appropriate mounting plate.
- J. All pulls shall be Stanley #4483-1/2 or equal 3-1/2" wire pulls, finish as selected by the Architect.
- K. 8mm fluted furniture pins shall be used as construction dowels. All case members shall be glued under pneumatic clamp pressure.
- L. Toe kick of 3/4" exterior grade plywood and shall be covered with plastic laminate except where shown to be otherwise.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. All carpentry and millwork shall be set accurately to required levels and lines, with members plumb and true and accurately cut and fitted. Carpentry and millwork items shall be properly anchored as shown on the drawings. Where not specifically shown, anchoring shall be of sufficient type and size as required to develop the necessary structural strength. Complete installation shall be in accordance with best recognized standards and as shown on the drawings and approved shop drawings.
- B. Install wood blocking for anchoring and supporting all hardware, accessories, fixtures, specialty items, etc.

- C. All millwork shall be properly set and anchored into place. Blocking shall be installed as required for anchoring. Joints shall be tight fitted.
- D. Trim work shall be installed with concealed anchors or fasteners where possible. Where face nailing is required, nails shall be placed so to avoid splitting and shall be set and filled. Blocking shall be installed as required for proper anchoring and shall be installed behind all joints. Joints in trim shall be made as nearly invisible as possible.

END OF SECTION

## SECTION 07210 – WALL AND CEILING INSULATION

### PART ONE – GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Division 1, General Requirements, apply to the work specified in this Section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered by this section consists of furnishing all equipment, labor and materials necessary to satisfactorily complete the wall and ceiling insulation work as indicated on the drawings and as specified herein.

#### 1.3 SUBMITTALS

- A. The Contractor shall furnish manufacturer's data and specifications, test reports, material certifications and any other information which may be required to insure compliance with these specifications.

### PART TWO – PRODUCTS

#### 2.1 MATERIALS

- A. Ceiling insulation shall be equal to Owens Corning Fiberglass Unfaced Thermal Batt Insulation, 9" thick.
- B. Stud wall insulation shall be equal to Owens Corning Sound Attenuation Fire Batt Insulation/MW, 3" thick.
- C. Masonry fill insulation shall be water repellent, free flowing vermiculite equal to Zonolite Masonry Insulation as produced by W.R. Grace Co..

### PART THREE – EXECUTION

#### 3.1 INSTALLATIONS

- A. Insulation shall be installed as shown on the drawings and as specified herein. All insulation shall be installed in strict accordance with manufacturer's instruction.
- B. Sound Attenuation fire batts in interior stud walls shall be friction fitted between studs and shall extend full height. Insulation shall be installed in walls shown on the drawings.
- C. Insulation in metal framing shall be fastened through the facing into the framing per manufacturer's instructions.
- D. Masonry fill insulation shall be poured into block cells in accordance with manufacturer's instructions. Pours shall not be over 48" to insure complete filling of all cells. Insulation shall extend from floor line to bottom of roof. Care shall be taken to seal all openings in walls and around all electrical boxes, conduits, pipes, etc. prior to installing insulation. Masonry fill insulation shall be installed in all fire rated masonry walls.



- D. All insulation shall be delivered to the site in unbroken wrappers or containers. Insulation shall be stored in strict accordance with manufacturer's instructions.

END OF SECTION

## **SECTION 07212 - ROOF INSULATION**

### **PART ONE - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. The General provisions of the Contract, including Division 1, General Requirements, apply to the work specified in this Section.

#### **1.2 DESCRIPTION OF WORK**

- A. The work consists of furnishing of all labor, materials accessories, and equipment necessary to install all roof insulation as indicated on the drawings and/or specified herein.

#### **1.3 SUBMITTALS**

- A. The Contractor shall submit manufacturer's data, material specifications, including Federal Spec. No. and ASTM Classifications, and any other information which may be required to ensure compliance with these specifications.

### **PART TWO - PRODUCTS**

#### **2.1 MATERIALS**

- A. All roof insulation shall be manufactured by the roofing manufacturer or by a manufacturer approved by the roofing manufacturer. Written approval shall be included in the submittal.
- B. Roof insulation shall be closed-cell polyisocyanurate foam core and universal fiberglass reinforced faced rigid insulation board. Boards shall have a compressive strength of 25 psi and shall comply with ASTM C1289. Insulation shall have a minimum thermal resistance of R-15. Insulation shall be equal to Schuller Ultra Gard or Johns Manville ISO 1. Tapered insulation shall be the same material and shall provide 1/4" per foot slope creating the drainage pattern shown on the drawings.
- C. Mechanical fasteners shall be the type recommended by the manufacturer for this type installation. Fasteners used over light weight concrete decks shall penetrate through the concrete and the metal deck below.
- D. Gypsum roof board shall be equal to Georgia-Pacific Dens Deck Roof Guard, 1/2" thick.
- E. Ice and Water Shield shall be equal to Grace.

### **PART THREE - EXECUTION**

#### **3.1 APPLICATION AND INSTALLATION**

- A. Roofing Contractor shall examine the deck and shall notify the General Contractor of any condition which is detrimental to the proper installation of the insulation and roofing. Work shall not proceed until after unsatisfactory conditions have been corrected.

- B. Roof insulation under metal roof panels shall consist of a 1 1/2" thick layer of rigid insulation board mechanically fastened to the structural metal deck. Over the rigid insulation board install a layer of Ice and Water Shield prior to metal roof insulation.
- C. Roof insulation over light weight concrete deck and under single ply membrane roof shall consist of a base layer of 1/2" thick rigid insulation board, layers of tapered insulation (1/2" minimum thickness at low points) with 1/4" slope per foot on top surface and a top layer of 1/2" thick gypsum roof board, all mechanically attached through metal deck under light weight concrete.
- D. No more insulation shall be installed than can be completely covered with moisture barrier the same day.
- E. Care shall be taken in handling of roof insulation to prevent damage of exposed surface areas and edges. All roof area shall be examined before roofing is applied and damage material shall be removed and replaced. Planking shall be used to distribute weight and support heavy materials when transported over the deck area.
- F. Wet or damp insulation shall be removed from the job. Under no circumstances will wet or damp insulation be permitted to be installed in the roof system. All insulation shall be stored above ground on wood pallets. All insulation stored or left on the job overnight shall be covered with waterproof tarpaulin. The tarpaulin shall be completely secured and rope tied at the end of each work day and when insulation is not being used.

### 3.2 GUARANTEE

- A. Roof insulation shall be included in the Roofing Guarantee specified in Section 07500.

END OF SECTION

## **SECTION 07240 – EXTERIOR INSULATION & FINISH SYSTEM**

### **PART ONE – GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. The General provisions of the contract, including Division 1, General Requirements, apply to the work specified in this Section.

#### **1.2 DESCRIPTION OF WORK**

- A. The work covered by this section consists of furnishing all equipments, labor and materials necessary to satisfactorily complete the exterior insulation and finish system and related work as indicated on the drawings and as specified herein.

#### **1.3 SUBMITTALS**

- A. The contractor shall furnish manufacturer's data, test reports, material certifications, installation instructions and any other information which may be required to insure compliance with these specifications.

### **PART TWO – PRODUCTS**

#### **2.1 MATERIALS**

- A. Exterior insulation and finish systems shall be InsulScreen 2000 Water Managed EIFS manufactured by U.S. Gypsum Co., or an approved equal. Substitutions shall be approved by the Architect prior to bidding.
- B. System shall consist of:
  - Gypsum Sheathing – GP Dens Glass Gold
  - Tyvek Stucco Wrap Weather Resistant Barrier
  - USG Exterior Insulation Board
  - Mechanical Fasteners
  - USG Exterior Mesh Reinforcement
  - USG Exterior Base Coat
  - USG Exterior Textured Finish
  - USG Starter Track, Casing Bead Drip, Flashing, Trim, Etc.
  - USG Water Barrier Tape, Sloped Sills, Step Flashing, Kickout Flashing, Sealants, Etc.
  - All other required accessories and materials

### **PART THREE – EXECUTION**

#### **3.1 APPLICATION**

- A. Application shall be in strict accordance with manufacturers written instructions. A copy of the instruction shall be submitted to the Architect for review prior to beginning the installation.

- B. Application of insulation board shall not begin until weather barrier, flashing, tape, starter track, casing bead, etc. are inspected by the Architect.
- C. Special care shall be given to the treatment of the exposed edges of insulation and finish. Treatment shall be applied as required to prevent water and moisture infiltrating into the system. EIFS Contractor shall coordinate and review the installation of sealant around the system.
- D. Contractor shall prepare sample of finish for Architect's approval prior to beginning finish work.

### 3.2 GUARANTEE

- A. General Contractor and EIFS Contractor shall jointly guarantee the system for a period of one year against defects in material and workmanship.
- B. During the one year period, if any defects are detected, the Contractor shall repair or replace the system and repair any other damage caused by the defect at no cost to the Owner.

END OF SECTION

## **SECTION 7270 – FIRESTOPPING**

### **PART ONE - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. The General Provisions of the contract, including Division 1, General Requirements, apply to the work specified in this section.

#### **1.2 DESCRIPTION OF WORK**

- A. The work covered by this section consists of furnishing all equipment, labor and material necessary to satisfactorily complete the firestopping and related work as indicated on the drawings and as specified herein.

#### **1.3 SUBMITTALS**

- A. Contractor shall furnish manufacturer's data, test reports, material certifications, installation instructions and any other information which may be required to ensure compliance with these specifications.
- B. Contractor shall also furnish data on material characteristics, performance and limitation criteria.

#### **1.4 QUALIFICATIONS**

- A. Manufacturer shall have a minimum of three (3) years of experience on the specialized manufacturing of firestopping materials.
- B. Applicator shall be an approved applicator by the manufacturer and shall have a minimum of three (3) years experience in the application of firestopping materials.

#### **1.5 REGULATORY REQUIREMENTS**

- A. Materials and applications shall conform to applicable codes for fire resistance ratings.

#### **1.6 ENVIRONMENTAL REQUIREMENTS**

- A. Foam materials shall not be applied when the temperature of substrate material and ambient air is below manufacturer's recommendations.
- B. This minimum temperature shall be maintained before, during, and for three (3) days after installation of materials
- C. Provide proper ventilation in areas to receive solvent cured materials.

#### **1.7 SEQUENCING**

- A. Work shall be sequenced to permit firestopping materials to be installed after adjacent and surrounding work is complete.

- B. Work shall be sequenced to permit all work using mechanical and electrical penetrations to be completed prior to sealing penetrations.

## PART TWO - PRODUCTS

### 2.1 MANUFACTURER MATERIALS

- A. Firestopping materials shall be equal to those manufactured by Dow Corning, G.E. Pensil or Flamesafe.
- B. Firestopping materials shall be suited for the particular application in which it is being used.
- C. Primers shall be types recommended by the firestopping manufacturer for the specific substrate and surface.

## PART THREE - EXECUTION

### 3.1 PREPARATION

- A. Contractor shall verify that the opening is ready to be sealed.
- B. Contractor shall clean surfaces of dirt, grease, oil, loose materials and other matter which may affect bonding of firestopping materials.
- C. Backing materials shall be installed to arrest liquid material leakage.

### 3.2 APPLICATION

- A. Firestopping materials and primers shall be applied in accordance with manufacturer's instructions.
- B. Materials shall be installed in sufficient thickness to achieve required rating.
- C. Firestopping materials shall be installed at all openings in fire rated wall and ceiling construction at smoke barriers.

### 3.3 CLEAN-UP

- A. All adjacent surfaces shall be cleaned of firestopping materials.

END OF SECTION

## **SECTION 07500 – MEMBRANE ROOFING**

### **PART ONE - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. The General provisions of the Contract, including Division 1, General Requirements, apply to the work specified in this Section.

#### **1.2 DESCRIPTION OF WORK**

- A. The work covered in this section consists of the furnishing of all labor, materials and equipment required to satisfactorily complete the membrane roofing and related items as indicated on the drawings and as specified herein.
- B. Membrane roofing shall be installed on all flat roof areas of the Science and Arts Building and the Fine Arts Building.

#### **1.3 SUBMITTALS**

- A. The Contractor shall submit manufacturer's data, material specifications, including Federal Spec. No. and ASTM Classifications, and any other information which may be required to ensure compliance with these specifications.
- B. The Contractor shall submit manufacturer's complete instructions and recommendations for the installation of the roofing system including flashing, trim, etc. Submittal shall include all applicable shop drawings, details, etc.

### **PART TWO – PRODUCTS**

#### **2.1 MATERIALS**

- A. All materials used in the roofing system shall be manufactured by a single roofing manufacturer or by a manufacturer that is approved by the primary roofing materials manufacturer. Approval of all roofing material substitutions must be obtained from the Architect prior to submitting a bid.
- B. Membrane roofing shall be Duro-Last 40 mil custom prefabricated single-ply roofing system or an approved equal. Roof shall have Factory Mutual Class 1-90 and UL Class A, 90 psf uplift ratings.
- C. Eave trim, fascia, flashing, ridge caps, ridge vents, etc. shall be formed of 24 gauge G-90 hot dipped galvanized steel with Kynar – 500 Paint Finish. Material shall be pre-finished with color selected from manufacturer's standard colors. Trim, fascia, flashing, etc. shall be formed as detailed on the drawings or as required to fit job conditions. All metal work shall conform to standard set forth in the SMACNA architectural sheet metal manual.
- D. Underlayment (moisture barrier) shall be Grace Ice and Water Shield or an approved equal. Underlayment shall be overlapped per manufacturer's recommendations.



- E. Plumbing vents shall be EPDM compression molded rubber boots or an approved equal, meeting the requirements of the metal roofing manufacturer. No plumbing vents shall be extended through roof on front or sides, only through rear portion of roof is acceptable. If any vents are installed on front or sides of roof, the roofing contractor shall not begin any roofing work until vents are relocated.
- F. Sealant shall be MONO Acrylic Terpolymer one part building sealant as manufactured by the Tremco Co. Color of sealant shall match the adjacent roofing or flashing color.
- G. Distribution plates shall be Factory Mutual approved stress distribution plates formed from 24 gauge minimum G-90 C.O. steel with galvalume coating. Fasteners shall be F.M. approved and shall be furnished by the membrane manufacturer. Fasteners shall go through the lightweight concrete deck and metal deck.
- H. Any other required roofing materials which are not specified shall be approved by the Architect prior to ordering.

### PART THREE – EXECUTION

#### 3.1 APPLICATION AND INSTALLATION

- A. The roofing system shall be applied in strict accordance with manufacturer's instructions. Application shall be done in one continuous operation as nearly as possible.
- B. All flashing materials, trim, fascia, etc. shall be properly lapped, anchored and sealed in an approved manner and shall be water and weather tight. All lines, rises and angles shall be sharp and true with plain surfaces free from waves and buckles. Detailing and fabrication shall be in accordance with recommendations of the "Architectural Sheet Manual" by the SMACNA and roofing manufacturer.

#### 3.1 GUARANTEE

- A. All roofing, flashing and associates work shall be guaranteed by the General Contractor against leaks from faulty or defective materials and workmanship for a period of five (5) years, starting on the date of acceptance of the project by the Owner.
- B. The "Roofing Guarantee" shall be executed in triplicate, signed by the appropriate party and submitted to the Owner through the Architect. See Section 07610.
- C. Standard manufacturer's guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama shall be amended to exclude such language and shall substitute the requirement that the Laws of the State of Alabama shall govern.

END OF SECTION

## SECTION 07610 – METAL ROOFING AND SHEET METAL

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General provisions of the Contract, including Division 1, General Requirements, apply to the work specified in this Section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered in this section consists of the furnishing of all labor, materials and equipment required to satisfactorily complete the metal roofing, sheet metal and related items as indicated on the drawings and as specified herein.
- B. Metal roof shall be installed over the new center core of the Science and Arts Building as shown on the drawings.

#### 1.3 SUBMITTALS

- A. The Contractor shall submit manufacturer's data, material specifications, including Federal Spec. No. and ASTM Classifications, and any other information which may be required to ensure compliance with these specifications.
- B. The Contractor shall submit manufacturer's complete instructions and recommendations for the installation of the roofing system including flashing, trim, etc. Submittal shall include all applicable shop drawings, details, etc.

#### 1.4 QUALITY ASSURANCE

- A. Roofing Contractor shall have specialized in sheet metal roof installation for at least five (5) years and shall be an "approved installer" by the roof manufacturer.
- B. A pre-roofing conference will be held before any roofing work is started. The conference will be conducted by the Architect and will be attended by representatives of the Owner, Building Commission Inspector, General Contractor, Roofing Contractor, Sheet Metal Contractor, Roof Deck Manufacturer and the Roofing Material Manufacturer.
- C. The roofing manufacturer shall make periodic inspection during the installation of the roofing.
- D. Prior to installing any metal roofing, the roof deck shall be inspected by the Roof Installer, Roof Manufacturer, General Contractor and Architect, to ensure that the deck is properly installed and is ready for the installation of the metal roofing. Each representative shall give his approval and acceptance of the deck. Any defects shall be corrected prior to beginning roofing.

#### 1.5 STORAGE AND HANDLING

- A. Store and handle materials in such a manner as to prevent damage.

- B. Materials shall be stacked to prevent twisting, bending or abrasion and to provide proper ventilation. Slope metal sheets to ensure drainage and prevent discoloration or staining.

## 1.6 WARRANTY

- A. Provide a 20-year manufacturer's warranty for the paint adhesion of metal panels and/or degradation of metal finish.
- B. This Contractor shall notify the General Contractor of the requirements and conditions of constructing the roof decks and/or full roofing assembly so as to meet the roofing manufacturer's standards for a minimum 20-year Water-tight Warranty. This Contractor, in conjunction with the roofing manufacturer, shall examine all surfaces which or against which his work is to be applied, and notify the Architect in writing of defects considered detrimental to proper installation or a Water-tight Warrantied roof assembly with flashing endorsement. The start of roofing work shall be considered an acceptance of all existing conditions by the Contractor performing this work. The Manufacturer will perform a final punch list inspection to assure compliance with the Contract Documents. The Manufacturer will provide the minimum 20-year Watertight Warranty to the Owner in the Close-Out Documents.
- C. In conjunction with other warranties, a 5-year roof guarantee to be provided by the General Contractor. This guarantee is attached to this section. This "General Contractor's Roofing Guarantee" shall be executed in triplicate, signed by the appropriate party and submitted to the Owner through the Architect.
- D. Provide warranties at the time of "Substantial Completion".

## PART TWO – PRODUCTS

### 2.1 MATERIALS

- A. All materials used in the roofing system shall be manufactured by a single roofing manufacturer or by a manufacturer which is approved by the primary roofing materials manufacturer. Approval of all roofing material substitutions must be obtained from the Architect prior to submitting a bid.
- B. Metal roof shall be formed of 24-gauge core steel sheets, pre-coated with Galvalume and shop finished with a specular low gloss fluorocarbon coating (Kynar 500 or equal) of color selected by the Owner. Sheets shall be formed with standing seams at 16" on center and a minimum of two pencil rib stiffening between seams.
- C. Manufacturer shall be SteeloX-LS (Loxseam), MBCI or an approved equal.

### 2.2 ACCESSORIES

- A. Fasteners shall be galvanized steel, concealed type with 16" x 6" x 18 gauge bearing plates. Fasteners shall be approved by the Roofing Manufacturer and shall comply with all requirements of UL I-90 roof. Fasteners shall go through the insulation and penetrate the deck a minimum of 1".
- B. Underlayment (moisture barrier) shall be Grace Ice and Water Shield or an approved equal. Underlayment shall be overlapped per manufacturer's recommendations.

- C. Ridge vent and cap shall be formed of sheets same as roofing.
- D. Trim, flashing, cleats, etc. shall be formed of sheets same as roofing.
- E. Protective backing paint shall be zinc chromate alkyd.
- F. Sealants, bedding compounds, cements, etc. shall be type recommended by roofing manufacturer.

## 2.3 FABRICATION

- A. Sections shall be formed to true shape, accurate in size, square and free from distortion or defects. Cleats shall be formed to interlock with sheets.
- B. Sheets shall be formed in longest practical lengths. Starter strips shall be continuous and interlockable with sheets.
- C. All exposed edges shall be hemmed ½" on underside with seamed and mitered corners.
- D. Flashing shall be fabricated to allow toe to extend 2" under roofing and all edges shall be returned and broke.
- E. All concealed metal surfaces shall be back painted with protective backing paint of a minimum dry film thickness of 15 mil.

## PART THREE – EXECUTION

### 3.1 EXAMINATION

- A. Roof deck shall be inspected to verify deck is clean and smooth, free of depressions, waves or projections, properly sloped to eaves. Deck shall be true and straight in both direction and shall not cause the roof panels to "oil can".
- B. Contractor shall verify that roof deck assembly will meet UL I-90 requirements and that prior to commencement of insulation and roofing, the integrity of the structural components are such to make the substrate acceptable.
- C. Contractor shall verify that roof openings, curbs, pipes, sleeves, vents, etc. through roof are solidly set, cant strips and reglets are in place and nailing stops are properly located.
- D. Contractor shall verify that roofing termination and base flashing are in place, sealed and secured.
- E. Beginning of the roofing and insulation operations shall mean the acceptance of the existing conditions.

### 3.2 PREPARATION

- A. Protect all elements surrounding this work from damage or disfigurement.
- B. Cover all roof insulation with underlayment /moisture barrier overlapping sheets ½.
- C. Field measure site conditions prior to fabricating work.

- D. Install starter and edge strips, and cleats before starting installation.

### 3.3 INSTALLATION

- A. Installation shall be provided by a manufacturer approved installer. Written certification shall be provided before commencement of work.
- B. Conform to drawing details included in SMACNA manual.
- C. Cleat and seam all joints.
- D. Use bedding compound for joints.
- E. Install roofing in single sheet from eave to ridge.
- F. Provide formed prefabricated flashings and boots for protrusions through roof such as vents, conduit, etc.
- G. Back paint surfaces in contact with dissimilar materials.
- H. Install Ice and Water Shield underlayment per manufacturer's recommendations on all surfaces to receive metal roof and flashing.

### 3.4 STANDING SEAM ROOFING

- A. Install per manufacturer's recommendations.
- B. Lay single sheets with long dimension perpendicular to eaves.
- C. Lock cleats into seams and flatten in direction of drainage.
- D. At eaves terminate roofing by hooking over edge strip.
- E. No exposed fasteners at eaves shall be allowed.

### 3.5 FLASHINGS

- A. Flashing shall conform to SMACNA details.
- B. Secure flashings in place using concealed fasteners.
- C. Cleat and seam all joints.
- D. Install all metal flashing in plastic cement.
- E. Fit flashing tight in place making corners square, surfaces true and straight in planes, and lines accurate to profile.
- F. Seal metal joints watertight.

### 3.6 APPEARANCE

- A. Only minor oil canning will be accepted. Roof panels shall be flat and true without any horizontal breaks or lines. On the first day of panel installation, the installation shall be inspected by the General Contractor, Roofing Manufacturer, Roof Installer and Architect, to ensure acceptability of materials and installation

### 3.7 GUARANTEE

- A. Metal roof shall be covered under the ABC General Contractor's Roofing Guarantee (ABC Form C-9).

END OF SECTION

## SECTION 07650 - THROUGH - WALL FLASHING

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the contract, including Division 1, General Requirements, apply to the work specified in this Section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered by this section consists of furnishing all equipment, labor and materials necessary to satisfactorily complete the through-wall flashing and related work as indicated on the drawings and as specified herein.

#### 1.3 SUBMITTALS

- A. The Contractor shall furnish manufacturer's data, test reports, material certifications and any other information which may be required to insure compliance with these specifications.

### PART TWO - PRODUCTS

#### 2.1 MATERIALS

- A. PVC through-wall flashing shall be 30 mil polyvinyl chloride sheets equal to Wascoseal Type 30 as manufactured by York Manufacturing Inc.
- B. Galvanized metal flashing shall be formed of 24 gauge galvanized sheet metal. Metal shall be formed as detailed on the drawings.
- C. Adhesives shall be the type recommended by the manufacturer of the materials being sealed or attached.

### PART THREE - EXECUTION

#### 3.1 INSTALLATION

- A. PVC and metal flashing shall be installed in strict accordance with manufacturer's instructions and as detailed in the drawings with all joints lapped not less than 6" and sealed with an adhesive recommended by the flashing manufacturer. All PVC flashing shall be extended up and under building felt 6" minimum. Where PVC flashing laps over metal flashing, the lap shall be 5" minimum. All open ends of flashing shall be turned up to form a dam which will prevent water from running off the ends.
- B. Care shall be taken to insure that flashing is not damaged after installation and that flashing is properly installed in the brick work as it is laid and that weep tubes are set directly on the flashing turnout.

### 3.2 INSPECTION

- A. All flashing shall be inspected by the Architect prior to covering or concealing.

END OF SECTION



## SECTION 07720 – ROOF INSULATION

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the contract including Division 1, General Requirements, apply to the work specified in this Section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered by this section consists of furnishing all labor, materials and equipment required to install all roof insulation as indicated on the drawings and/or specified herein.

#### 1.3 SUBMITTALS

- A. The Contractor shall submit manufacturer's data, material specifications, including Federal Spec. No. and ASTM Classifications and any other information that may be required to ensure compliance with these specifications.

### PART TWO – PRODUCTS

#### 2.1 MATERIALS

- A. All roof insulation shall be manufactured by the roofing manufacturer or by a manufacturer approved by the roofing manufacturer. Written approval shall be included in the submittal.
- B. Roof insulation shall be 1 ½" thick closed-cell polyisocyanurate foam core and universal fiberglass reinforced faced rigid insulation board. Boards shall have a compressive strength of 25 psi and shall comply with ASTM C 1289. Insulation shall be equal to Schuller Ultra Gard or Johns Manville ISO 1.
- C. Tapered insulation shall be formed of the same material as roof insulation and shall provide a slope of ¼" per foot.
- D. Mechanical fasteners shall be the type recommended by the manufacturer for this type installation and shall meet all requirements of Factory Mutual for a Class I-90 Roofing System.
- E. 1 ½" thick insulation board shall be installed over plywood deck under all metal roofing. 1 ½" thick base layer of insulation board shall be installed under flat membrane roofing. Tapered insulation boards shall be installed over base layer and under membrane roofing to form drainage pattern as shown on roof plan. All insulation shall be covered moisture barrier prior to roofing installation.

### PART THREE – EXECUTION

#### 3.1 APPLICATION AND INSTALLATION

- A. Roofing Contractor shall examine the deck and shall notify the General Contractor of any condition that is detrimental to the proper installation of insulation and roofing. Work shall not proceed until after unsatisfactory conditions have been corrected.
- B. Roof insulation on sloped decks shall consist of a single layer of 1 ½" thick insulation board applied directly to the deck with long joints continuous at right angles to the long direction of the deck. All end joints shall be staggered. Insulation shall be mechanically attached to the deck in strict accordance with manufacturer's instructions. Instructions shall include the type and spacing of the fasteners and shall be submitted to the Architect for review prior to beginning any work.
- C. Roof insulation on flat decks shall consist of one base layer o 1 ½" thick insulation board and tapered insulation providing ¼" per foot slope and the drainage pattern shown on the drawings. Insulation shall be applied as follows:
  - 1. The initial layer of 1 ½" thick insulation shall be applied directly to the deck with long joints continuous at right angles to the deck. All end joints shall be staggered. Insulation shall be mechanically attached to the deck in strict accordance with manufacturer's instructions. Instructions shall include the type and spacing of the fasteners and shall be submitted tot the Architect for review prior to beginning any work.
  - 2. Tapered insulation shall be installed over the base layer of flat insulation to form the drainage pattern shown on the drawings and as required by job conditions to eliminate any ponding water on the flat roof. Tapered insulation shall be mechanically fastened to the deck same as roof insulation.
- D. No more insulation shall be installed than can be completely covered with moisture barrier (on underlayment) in the same day.
- E. Care shall be taken in handling of roof insulation to prevent damage of exposed surface areas and edges. All roof area shall be examined before roofing is applied and damaged material shall be removed and replaced. Planking shall be used to distribute weight and support heavy materials when transported over the deck area.
- F. Wet or damp insulation shall be removed from the job. Under no circumstances will wet or damp insulation be permitted to be installed in the roof system. All insulation shall be stored above ground on wood pallets. All insulation stored or left on the job overnight shall be covered with waterproof tarpaulin. The tarpaulin shall be completely secured and rope tied at the end of each work day and when insulation is not being used.

### 3.2 GUARANTEE

- A. Roof insulation shall be included in the Roofing Guarantee specified in Section 07610.

END OF SECTION

## SECTION 07920 - SEALANT, CAULKING AND JOINT FILLER

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the contract including Division 1, General Requirements, apply to the work specified in this Section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered by this section consists of furnishing all labor, materials and equipment required to satisfactorily complete all the sealant, joint fillers, caulking, and related work as indicated on the drawings and as specified herein.

#### 1.3 SUBMITTALS

- A. The Contractor shall furnish manufacturer's data, test reports, material certifications installation instructions and any other information that may be requested to insure compliance with these specifications.

### PART TWO - PRODUCTS

#### 2.1 MATERIALS

##### A. Definitions:

1. The term "sealant" as used in these specifications and on the drawings shall designate a material used to prevent the penetration of water or to make a condition watertight.
2. The term "caulk" as used in these specifications and on the drawings shall designate a material used as a "filler" of joints, etc. Caulking, unless otherwise noted, shall only be used on the interior of the building.

- B. All exterior sealant used for masonry, concrete and stucco joints shall be "Tremco MONO" one part acrylic building sealant as manufactured by Tremco Sealant Systems.

- C. Back-up material and joint fillers shall be Polyurethane or Polyethylene foam backer rods unless noted otherwise on the drawings.

- D. All exterior and interior glazing sealant shall be "Dow Corning 999" one part silicone building and glazing sealant as manufactured by the Dow Corning Corporation.

- A. All general purpose interior caulk shall be "Tremco Acrylic Latex 834" as manufactured by Tremco Sealant Systems.

- F. Primer where required shall be as recommended by sealant or caulking manufacturer.

- G. The color of all sealant and caulking materials shall be selected by the Architect prior to use. Failure to consult the Architect regarding color selection may result in removal and replacement of the material.

## PART 3 - EXECUTION

### 3.1 INSTALLATION AND APPLICATION

- A. Installation and application of sealants and caulking shall be in strict accordance with manufacturer's instructions.
- B. Installation and application shall be by an experienced mechanic and shall produce a smooth, even and uniform bead. Any sealant or caulking joints that are not neatly done shall be replaced.

END OF SECTION

## SECTION 08100 - METAL DOORS & FRAMES

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Division 1, General Requirements, apply to the work specified in this section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered by this Section consists of furnishing and installing all metal doors, frames and related items required to complete the work indicated on the drawings and as specified herein.

#### 1.3 SUBMITTALS

- A. Shop drawings and manufacturers data shall be submitted in quintuplicate to the Architect for review prior to fabrication. Shop drawings shall meet all the requirements as set forth under the General Conditions.

### PART TWO - PRODUCTS

#### 2.1 MATERIALS

- A. Hollow Metal Doors: Doors shall be of flush construction 1-3/4" thick with panels of 18 gage cold rolled steel. Doors shall be reinforced, stiffened, sound deadened and insulated with impregnated Kraft honeycomb core completely filling the inside of the doors and laminated to both inside faces of the panels. Doors shall have continuous vertical mechanical interlocking joints at lock and hinge edges. Doors shall have beveled, 1/8" in 2" hinge and lock edges. Top and bottom 14 gage cold rolled steel reinforcing channels shall be spot welded within the door.
- B. Frames: Frames shall be formed or rolled of not less than 16 gage pickled and annealed steel. Heads and jambs shall have mitered corners, reinforced and shall be continuously welded and ground off smooth. Frames shall be delivered with removable steel angle spreader welded to the bottom of frames to insure parallel alignment. Three (3) 16 gage adjustable steel anchors shall be provided for each jamb. Frames shall be drilled for three (3) rubber mutes. Frames shall be properly reinforced to receive hardware.
- C. Reinforcement: Hollow metal units shall be prepared to receive finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with hardware schedule and templates. Preparation shall comply with applicable requirements of ANSI A115 "Specifications for Door and Frame Preparation". Reinforcement shall be as follows:
  - 1. Hinges: Steel plate 3/16" thick x 1 1/2" wide x 6" longer than hinges, secured by not less than 6 spot welds.
  - 2. Locks and Flush Bolts: 12 gage sheet steel, secured by not less than 2 spot welds.
  - 3. Closers: 12 gage sheet steel, secured by not less than 6 spot welds.

4. Strike Plates: Steel plate 3/16" thick x 1 1/2" wide x 3" long, secured by not less than 2 spot welds.

Plates shall be pre-drilled and tapped in the shop except for surface applied hardware which may be field drilled and tapped.

- D. Louvers: Louvers shall be sight-proof stationary louvers constructed of inverted V-shaped or Y-shaped blades formed of 24 gage cold rolled steel set into a 20 gage steel frame. Louvers shall be size shown and shall be factory installed.
- E. Paint: Doors, frames and louvers shall be bonderized and finished with one coat of baked-on zinc chromate rust inhibiting primer.
- F. Anchors: Jamb anchors shall be 16 gage galvanized steel adjustable, masonry "T", wood stud anchors welded inside the frame. Three (3) anchors shall be provided for each jamb. Floor anchors shall be 14 gage galvanized steel, clip type with 2 holes for fasteners. Clips shall be welded to each jamb and mullion which extends to the floor.
- G. Accessories: Plaster guards of 26 gage steel shall be welded to frames at the back of hardware cutouts where mortar or other materials might obstruct hardware installation. Plastic plugs shall be installed in holes for rubber mutes to keep holes clear during construction. Provide all other accessories required to complete the work. Provide 3 rubber silencers per door.
- H. Mullions, Transom Bars, Frames for Glass, Stops and Molding: Mullions, transom bars and frames for glass shall be closed or tubular sections similar to door frames. Bars shall be fastened to frames by butt welding with joint reinforced with concealed clip angles of same metal and thickness as frames. Stops and molding shall be formed or heavy gage sheet steel to dimension shown or as required for proper installation. Stops and molding shall be applied with counter sunk tamper-proof screws spaced uniformly not more than 8" o.c. Corner shall be butted with only a hairline joint visible.
- I. Contractor shall verify all requirements for installation of glass, hardware, etc. Any conflicts shall be brought to the attention of the Architect prior to bidding. Failure to do so will not relieve the Contractor of the responsibility of furnishing materials required for proper installation.
- J. Fire door and frame assemblies where required on the drawings shall have been investigated and successfully tested in accordance with the latest revision of ASTM Designation E-152. The door and frame shall each have an attached label indicating the applicable fire test rating.
- K. Metal frame supplier shall have the existing frames, which are to be reused and require fire rating investigated by a certified person qualified to test and apply fire-rating labels. Any frame failing to pass the required investigation shall be replaced. All existing fire-rated frames shall have new labels indicating the required rating.

## 2.2 MANUFACTURER

- A. Hollow metal doors and frames shall be by the same manufacturer. Units shall be manufactured by Steelcraft, Amweld, Republic, Ceco, Truscon or other approved manufacturer.

## PART THREE - EXECUTION

### 3.1 INSTALLATION

- A. Installation of hollow metal units and accessories shall be in accordance with the approved shop drawings, manufacturer's data and instructions, and as specified herein.
- B. Frames shall be accurately set in position, plumbed, aligned and braced securely until permanent anchors are set. Floor anchors shall be set with powder-activated fasteners. Jamb anchors shall be securely anchored in masonry walls. All frames set in masonry shall be filled completely with grout. Temporary braces and spreaders shall not be removed until wall construction is complete and anchors properly set and secured.
- C. Doors shall be fitted accurately to frames with proper clearances as specified in S.D.I. 100. Installation of finish hardware is specified in Section 08700.

### 3.2 ADJUSTMENT AND PROTECTION

- A. Doors and frames shall be properly protected during storage and after installation. Units with dents or imperfect seams will not be acceptable. Filling of dents and/or other repair work at the job site will not be permitted. Immediately after installation, units shall be sanded to remove any rusted or damaged areas in prime coat and touched up with a compatible air-drying primer.
- B. Check and readjust operation of hollow metal units and hardware prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable.

END OF SECTION

## SECTION 08210 - WOOD DOORS

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Division 1, General Requirements, apply to the work specified in this section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered by this Section consists of furnishing and installing all wood doors as indicated on the drawings and as specified herein.

#### 1.3 REFERENCES

- A. AHA A135.4 -Basic Hardboard; American Hardboard Assn.
- B. AWI P-200 - Architectural Woodwork Quality Standards
- C. NFPA 80 - Standard for Fire Doors and Windows
- D. NFPA 252 - Standard Methods of fire Tests of Door Assemblies
- E. UL (BMD) - Building Materials Directory; Underwriters Lab.

#### 1.4 SUBMITTALS

- A. Submit 5 copies of shop drawings and manufacturers data to the Architect for review prior to fabrication. Shop drawings shall meet all the requirements as set forth in the General Conditions.

#### 1.5 DELIVERY, STORAGE AND PROTECTION

- A. Doors shall be packaged, delivered and stored in accordance with AWI 1300.
- B. Doors shall be protected with resilient packaging. Doors shall not be stored in damp or wet areas.

#### 1.6 COORDINATION

- A. Coordinate doors with frames and hardware.

### PART TWO - PRODUCTS

#### 2.1 DOORS

- A. Flush panel solid core wood doors shall be the size and thickness shown on the drawings. Doors shall have thoroughly kiln dried hard wood face veneers laid with grain vertical. All doors shall have face veneers of "PREMIUM AA GRADE UNIFORM LIGHT BIRCH", BOOKMATCHED, 5 PLY CONSTRUCTION. Face veneer on all doors shall have a uniform light birch color. Doors with dark birch grain, streaks or patches showing on the face veneer will not be acceptable. Face veneers shall be of standard thickness and shall be applied at right angles to cross banding veneers. Cross banding veneers shall be thoroughly kiln dried hardwood ½" thickness extending full width of door. Both cross banding veneers and face veneers shall be placed full size over wood block core built of



White Pine or equal narrow staves. Stile edges shall be banded with thoroughly kiln dried hardwood which matches the face veneers. Top and edge bands shall be 5/8" thick minimum. Top and bottom edges shall be banded with 2 pieces of 3/4" thick glued hardwood. All edge bands shall be laminated to the core with waterproof resin glue by high frequency process. Cross banding and face veneers shall be laminated to the core with 100% waterproof resin glue by the hot plate process. Doors shall be trimmed square and factory pre-fitted to standard book size. Doors shall be smooth belt sanded on both sides with 3/0 and 5/0 paper and individually wrapped.

- B. Door panels shall be provided with glass and louver openings as shown on the drawings. Matching hardwood glass tops shall be furnished and shall be tacked in loose in the openings. Openings in fire rated doors shall be framed with metal stops.
- C. Flush panel wood doors shall be equal to Weyerhaeuser DSC-1 Staved Core or DPC-1 Particle Board Core.
- D. Fire-Rated doors, where required on the drawings, shall have been investigated and successfully tested in accordance with the latest revisions of ASTM designation E-152. The door shall have an attached label indicating the applicable fire test rating.

## PART THREE - EXECUTION

### 3.1 INSTALLATION

- A. Doors shall be neatly fitted into openings, back edge slightly beveled to prevent binding, front edge slightly beveled to permit closing.
- B. Doors shall be properly protected during storage and after installation. All damaged or warped doors shall be replaced. Doors shall be sealed as specified in Painting Section before or immediately after installation.
- C. Door installation shall be in accordance with manufacturer's instructions and AWI Quality Standards.

### 3.2 Guarantee

- A. Doors shall be guaranteed for one (1) year against delamination, defective materials, and workmanship. A copy of guarantee shall be submitted with shop drawings for approval.

END OF SECTION

## SECTION 08410 - ALUMINUM STOREFRONT AND ENTRANCES

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the contract, including Division 1, General Requirements, apply to the work specified in this section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered by this section consists of furnishing all equipment, labor and materials necessary to satisfactorily complete all the aluminum storefront, entrances and related work as indicated on the drawings and as specified herein.

#### 1.3 RELATED WORK

- A. The Contractor is responsible for coordination of work included in this section with all other specification sections related to furnishing of all materials, labor, permits, fees, and services necessary for completion of work in this section.

#### 1.4 SUBMITTALS

- A. The Contractor shall provide manufacturer's data, shop drawings, test reports, material certification, etc. to Architect for review prior to fabrication.
- B. Shop drawings shall include system and component dimensions; components within assembly; framed opening requirements and tolerances; anchorage and fasteners; glass and infills; door hardware requirements; and related work.

#### 1.5 PERFORMANCE

- A. System shall provide for expansion and contraction within system components caused by a cycling temperature range of 170F degrees without causing detrimental effects on system or components.
- B. Design and size members to withstand dead load and live load caused by pressure and suction of wind as calculated in accordance with International Building Code.
- C. Limit mullion deflection to 1/200, or flexure limit of glass with full recovery of glazing materials, whichever is less.
- D. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior.
- E. Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of assembly surface area, measure at a reference differential pressure across assembly of 0.3 inches water gage.
- F. System to accommodate, without damage to system or components, or deterioration of perimeter seal: Movement within system, movement between systems and perimeter framing components; dynamic loading and release of loads and deflection of structural support framing.

## 1.6 WARRANTY

- A. Contractor shall warranty the materials and installation to be watertight for a period of five (5) years from the date of substantial completion.

## PART TWO – PRODUCTS

### 2.1 MATERIALS

- A. Aluminum entrances shall be equal to Kawneer 350 Medium Stile Entrance with Paneline II concealed rod exit device and "CPN" Style Pull. Entrance shall be single acting, equipped with SAM-II concealed overhead closer, top, bottom and intermediate offset pivots, standard lock (cylinders for master-key shall be furnished in Finish Hardware), fully weather-stripped including 38-560 sweep and ½" x 4 ½" aluminum threshold. Entrances shall have dark bronze anodized finish.
- B. Aluminum framing at exterior entrance doors and windows shall be equal to Kawneer TRIFAB VG 451 Center Plane Framing System for 1" glazing (2" x 4 ½") Framing shall include transoms, sidelights, crossrails and base members. Aluminum framing shall have dark bronze anodized finish.
- C. Glass shall be insulated units, 1" sections of ¼" tinted tempered glass inside and out.
- D. Doors shall be equipped with concealed overhead closers, standard locks, exit devices, pulls, aluminum threshold, fully weather stripped and all other hardware and accessories required to properly complete the installation. Closers and thresholds shall be handicapped accessible.

## PART THREE - EXECUTION

### 3.1 INSTALLATION

- A. All members shall be installed in the correct location and shall be level, square, plumb and at proper elevations and in alignment with other work.
- B. All members shall be accurately cut and fitted to provide tightly closed joints. Complete system shall be sealed with sealant to secure a watertight job. All sealant shall be applied by experienced skilled mechanics and shall be clean and smooth with straight even lines.
- C. Complete fabrication and installation of framing system shall comply with recommendations and instructions of glass and framing manufacturers.
- D. All aluminum shall be cleaned and left in first class condition for acceptance by Owner.

END OF SECTION

## SECTION 08520 - WINDOWS

### PART ONE- GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract including Division 1, General Requirements, apply to the work specified in this Section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered in this Section consists of furnishing and installing all operating windows as indicated on the drawings and as specified herein.
- B. Windows shall be single hung unit with poured polyurethane structural thermal break to match existing. Upper lite shall be fixed and sash shall be removable. Units shall be factory glazed with insulated glass. Screens are not required.

#### 1.3 PERFORMANCE

- A. Windows shall be designed and members sized to withstand dead load and live loads caused by pressure and suction of wind as calculated in accordance with the International Building Code. Windows shall meet the AAMA performance requirements for Projected Windows, Class AP-AW80.

#### 1.4 SUBMITTALS

- A. Submit 5 copies of shop drawings and manufacturers data to the Architect for review prior to fabrication. Shop drawings shall meet all the requirements as set forth in the General Conditions. Shop drawings shall provide window dimensions, framed opening tolerances and installation requirements.

### PART TWO - PRODUCTS

#### 2.1 WINDOWS

- A. Windows shall be EFCO Series 3902 Projected/Casement Window or an approved equal. Windows shall have bone white Fluoropolymer 70% Kynar resin finish on interior and exterior exposed surfaces to match existing.

#### 2.2 MATERIALS

- A. Windows shall be constructed to Aluminum extrusions, 6063-T5 alloy. Thickness of all primary members shall not be less than .058" at head, jambs, and sash members. Sill members shall be .062" thickness. Main frame shall not be less than 3.25" deep.
- B. Each window shall have aluminum cam locks at projected windows and 2-point lift locks and pull handles at casements.
- C. Fasteners shall be stainless steel.

- D. Weather stripping shall be secured in extruded ports on sash perimeter and shall consist of rigid PVC weather seal in one side of the vertical stiles and pile conforming to AAMA 701-92 with polypropylene center fin in other locations.
- E. Screens are not required.
- F. All windows shall be factory glazed with 1" insulated glass units consisting of ¼" thick clear tempered glass lites inside and out.
- G. Windows shall be factory finished with bone white Fluoropolymer 70% Kynar resin paint on all exposed surfaces to match main building.

### PART THREE - EXECUTION

#### 3.1 INSTALLATION

- A. Window openings shall be properly prepared to receive window, plumb, level and within tolerance. Provide blocking for proper anchoring of windows and trim.
- B. Install windows in strict accordance with manufacturer's recommendations and approved shop drawings. Windows shall be set plumb, square and level without twist or bow. Windows shall be properly supported and securely anchored.
- C. Apply sealant at all joints per manufacturer's recommendations, wipe off excess and leave exposed sealant surface clean and smooth.
- D. Window installation shall be completely weather tight and windows shall be adjusted as required for proper operation. Window shall be cleaned and shall be free of construction debris, marks, fingerprints, etc.

#### 3.2 GUARANTEE

- A. Windows including glass shall be guaranteed for five (5) years against defective materials and workmanship and to remain weather tight.

END OF SECTION

## SECTION 8700 - FINISH HARDWARE

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Division 1, General Requirements, apply to the work specified in this section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered by this Section consists of furnishing all labor, materials and equipment required to satisfactorily complete the finish hardware work and related work as indicated on the drawings and as specified herein.

#### 1.3 COORDINATION

- A. The hardware supplier shall coordinate hardware with related trades such as millwork, doors and hollow metal.
- B. Immediately after award of the finish hardware contract, it shall be the responsibility of hardware supplier to request approved shop drawings from such trades with which hardware must be coordinated.
- C. All items of hardware shall be delivered to the job site in manufacturer's original package. Each item shall be clearly marked with the proper opening number so that installer can clearly identify the proper locations.

#### 1.4 QUALIFICATIONS

- A. Personnel who will be responsible for scheduling, detailing, ordering and coordinating hardware for this project shall be an experienced hardware consultant. Regular membership in the American Society of Architectural Hardware Consultant is acceptable evidence of such experience.

#### 1.5 SUBMITTALS

- A. Hardware supplier shall prepare and submit to the Architect for approval, five (5) copies of the complete detailed hardware schedule. This shall be done within fifteen (15) working days after receipt of purchase order. Catalog data sheets shall be submitted for each item of hardware.
- B. Hardware supplier shall schedule and detail each door separately. On doors of different sizes or where hardware changes such as butts, closer and locks are different, a separate heading shall be used. No openings of Class A label shall be combined with other label classifications.
- C. The hardware supplier shall submit a sample of each item of hardware that differs from the specification. He will also submit the manufacturer's name and catalog information and an explanation for the substitution at least ten (10) days prior to the bidding of the general contract. The Architect, if he approves the substitution, will issue an addendum to the specification prior to bidding, listing the approved item.

- D. If requested by Architect, a sample of each hardware item will be supplied as required, to be retained by Architect for comparison with hardware as furnished, any deviation from hardware scheduled shall be replaced with the proper hardware at the hardware supplier's expense.
- E. All template information shall be sent to each manufacturer who requires such information. (Example: custom hollow metal door and frame manufacturers, etc.) Approved hardware schedule shall be sent to each manufacturer who required template information.
- F. After installation of all hardware and before the building is accepted, the General Contractor shall request the hardware supplier to inspect the installation and certify that the hardware is properly installed in accordance with the manufacturer's recommendations. The hardware supplier shall furnish the Owner a record of the location of all locks and the key code of each. The complete hardware system shall be guaranteed for a period of one year against defected materials and workmanship. The guarantee as published by each manufacturer will begin when the Owner accepts the building.

#### 1.6 PRODUCT HANDLING

- A. Hardware shall be ordered in sufficient time so that it will be available to the General Contractor for job requirements.
- B. If doors are to be field painted or finished, all hardware shall be removed from doors by General Contractor prior to painting or finishing. After paint or finish has completely dried, General Contractor shall reinstall all hardware in accordance with manufacturer's recommendations.

### PART TWO - PRODUCTS

#### 2.1 MATERIALS

- A. Items listed herein are taken from the following manufacturer's catalogs: Stanley, Schlage, Norton, Sargent, Ives, and Nation Guard. Approved equal products by other manufacturers will be accepted except where noted. Keyed locks shall be tied into master keying system with sub systems as required.
- B. Hinges shall be Stanley of any size and weight listed in the hardware schedule. All exterior doors shall have NRP hinges.
- C. Lock and Latch Sets shall be Schlage D-Series Athens Lever Design with 626 (26D) satin chromium plated finish.
- D. Door closures shall be equal to Sargent of any type and size indicated on the schedule.
- E. Door stops shall be equal to Ives or Trimco.
- F. Thresholds shall be equal to National Guard.
- G. Flush bolts shall be equal to Ives or Trimco.

- H. The hardware supplier shall consult with Architect and secure written approval of complete keying layout prior to placing lock order with factory. After installation of all hardware and before acceptance of the building, the hardware supplier shall check each locked door against key code index to make certain that the correct locks and cylinders are on proper door. Any improperly located items shall be corrected. Locks shall be keyed into master key systems and grand master key system as directed by Architect.

## 2.2 HARDWARE LOCATION

- A. A schedule of mounting heights for all items of hardware shall be established in consultation with the Architect and shall be included in hardware schedule for approval.
- B. Degree of opening for doors with closures, etc. shall be established by hardware supplier and included in hardware schedule for Architect's approval.
- C. Hardware supplier shall coordinate hardware locations and installation requirements with door and frame supplier.
- D. All hardware shall comply with applicable requirements of the Americans With Disabilities Act (ADA).

## PART THREE - EXECUTION

### 3.1 INSTALLATION

- A. All hardware shall be installed by carpenter mechanics, skilled in the application of institutional grade hardware. All instruction sheets and installation details, which are packed with the hardware, shall be read and understood before any attempt is made to install the hardware.
- B. After installation, all templates, instruction sheets and installation details, shall be placed in a file folder to be turned over to Owner when building is accepted.
- C. After the building is occupied, the hardware supplier shall contact the Owner and arrange an appointment with the custodian or maintenance engineer. The hardware supplier will then instruct this person in the proper use, servicing, adjusting and maintenance of hardware.

### 3.2 KEYING

- A. All locks shall be keyed into the grand master key system with sub systems as required.
- B. Two (2) keys shall be provided for each lock. Six (6) grand master keys shall be provided. Six (6) construction keys shall be provided.
- C. All keys shall be delivered to the Architect clearly tagged and identified along with the key code index.



## FINE ARTS BUILDING

### Set 1

1 Pr. Cylinder	Coordinate with Door Manufacturer	626
All other hardware shall be provided by Door Manufacturer		

### Set 2

3 Pr Hinges	FBB 179 4 1/2" x 4 1/2"	626
2 Exit Devices	WD 8600-88-C-L-13-B	626
2 Closers	350 - PQ - DA	626
2 Kick Plates	10" x 2" LDW	ALUM
2 Wall Stops	402	626

### Set 3

3 Pr Hinges	FBB 179 4 1/2" x 4 1/2" F. V.	626
1 Lockset	D 70 PD	626
2 Closers	350 - PQ	626
2 Flush Bolts	262	626
2 Wall Stops	402	626

### Set 4

1 1/2 Pr Hinges	FBB 179 4 1/2" x 4 1/2"	626
1 Exit Device	WD 8600-88-C-L-13-B	626
1 Closer	350 - PQ - DA	626
1 Kick Plate	10" x 2" LDW	ALUM
1 Wall Stop	402	626

### Set 5

1 1/2 Pr Hinges	FBB 179 4 1/2" x 4 1/2" F. V.	626
1 Lockset	D 70 PD	626
1 Closer	350 - PQ	626
1 Wall Stop	402	626

### Set 6

1 1/2 Pr Hinges	FBB 179 4 1/2" x 4 1/2"	626
1 Lockset	D 70 PD	626
1 Closer	350 - PQ - DA	626
1 Kick Plate	10" x 2" LDW	ALUM
1 Wall Stop	402	626

### Set 7

1 1/2 Pr Hinges	FBF 179 4 1/2" x 4 1/2" F. V.	626
1 Passage Set	D 10 S	626
1 Closer	350 - PQ - DA	626
1 Kick Plate	10" x 2" LDW	ALUM
1 Wall Stop	402	626

### Set 8

1 1/2 Pr Hinges	FBF 179 4 1/2" x 4 1/2" F. V.	626
1 Lockset	D 50 PD	626
1 Wall Stop	402 1/2	626

### Set 9

1 1/2 Pr Hinges	FBF 179 4 1/2" x 4 1/2" F. V.	626
1 Lockset	D 80 PD	626
1 Closer	350 - PQ	626
1 Kick Plate	10" x 2" LDW	ALUM
1 Threshold	896	ALUM

## **SCIENCE AND ARTS BUILDING**

### Set 1

1 Pr. Cylinder	Coordinate with Door Manufacturer	626
All other hardware shall be provided by Door Manufacturer		

### Set 2

1 1/2 Pr Hinges	FBF 179 4 1/2" x 4 1/2" F. V.	626
1 Lockset	D 80 PD	626
1 Closer	350 - PQ	626
1 Kick Plate	10" x 2" LDW	ALUM
1 Wall Stop	402	626

### Set 3

1 1/2 Pr Hinges	FBF 179 4 1/2" x 4 1/2"	626
1 Exit Device	WD 8600 - 88 - L-L-15	626
1 Closer	350 - PQ	626
1 Kick Plate	10" x 2" LDW	ALUM
1 Wall Stop	402	626

#### Set 4

1 1/2 Pr Hinges	FBB 179 4 1/2" x 4 1/2"	626
1 Passage Set	D 10 S	626
1 Closer	350 - PQ -DA	626
1 Kick Plate	10" x 2" LDW	ALUM
1 Wall Stop	402	626

#### Set 5

3 Pr Hinges	FBB 179 4 1/2" x 4 1/2"	626
2 Exit Devices	WD 8600-88-L-L-15	626
2 Closers	350 - PQ - DA	626
2 Kick Plates	10" x 2" LDW	ALUM
2 Wall Stops	402	626

#### Set 6

3 Pr Hinges	FBB 179 4 1/2" x 4 1/2"	626
1 Lockset	D 80 PD	626
2 Flush Bolts	262	626
2 Closers	350 - PQ	626
2 Kick Plates	10" x 2" LDW	ALUM
2 Wall Stops	402	626

#### Set 7

1 1/2 Pr Hinges	FBB 179 4 1/2" x 4 1/2"	626
1 Lockset	D 50 PD	626
1 Closer	350 - PQ - DA	626
1 Kick Plate	10" x 2" LDW	ALUM
1 Wall Stop	402 1/2	626

#### Set 8

1 1/2 Pr Hinges	FBB 179 4 1/2" x 4 1/2" F. V.	626
1 Lockset	D 70 PD	626
1 Closer	350 - PQ - DA	626
1 Kick Plate	10" x 2" LDW	ALUM
1 Wall Stop	402 (Use Floor Stop 436 where lever does not strike wall)	626

#### Set 9

1 1/2 Pr Hinges	FBB 179 4 1/2" x 4 1/2"	626
1 Exit Device	WD 8600-88-L-L-15	626
1 Closer	350 - PQ - DA	626
1 Kick Plate	10" x 2" LDW	ALUM
1 Wall Stop	402	626

#### Set 10

1 1/2 Pr Hinges	FBB 179 4 1/2" x 4 1/2" F. V.	626
1 Dead Lock	B 762	626
1 Wall Stop	402	626

#### Set 11

1 1/2 Pr Hinges	FBB 179 4 1/2" x 4 1/2"	626
1 Privacy Set	D 40 S	626
1 Bumper Stop	471	626

#### Set 12

1 1/2 Pr Hinges	FBB 179 4 1/2" x 4 1/2"	626
1 Lockset	D 70 PD	626
1 Wall Stop	402	626

#### Set 13

1 1/2 Pr Hinges	FBB 179 4 1/2" x 4 1/2"	626
1 Lockset	D 50 PD	626
1 Wall Stop	402 1/2	626

#### Set 14

1 1/2 Pr Hinges	FBB 179 4 1/2" x 4 1/2" F. V.	626
1 Lockset	D 70 PD	626
1 Floor Stop	436	626

END OF SECTION

## **SECTION 08800 - GLASS AND GLAZING**

### **PART ONE - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. The General Provisions of the contract, including Division 1, General Requirements, apply to the work specified in this section.

#### **1.2 DESCRIPTION OF WORK**

- A. The work covered by this section consists of furnishing and installing all glass and related work indicated on the drawings and as specified herein.
- B. Glass for windows is specified in Section 08500.

#### **1.3 SUBMITTALS**

- A. Shop drawings and manufacturer's data shall be submitted to the Architect for review prior to fabrication.

### **PART TWO - PRODUCTS**

#### **2.1 MATERIALS**

- A. All glass shall be manufactured by PPG Industries, Inc., LOF, Owens-Illinois Glass Co. or approved equal. Each piece of glass shall bear the manufacturer's label showing grade, thickness and quality.
- B. Insulating glass units for aluminum store front windows and side lites shall be 1" thick units equal to PPG Commercial Insulating Glass Units consisting of 1/4" solargray glass exterior lite, 1/2" air space and 1/4" clear glass interior lite. Glass shall be tempered where required by code.
- C. Glass for aluminum entrance shall be 1/4" thick solargray tempered glass manufactured by PPG Industries, Inc.
- D. Tempered glass shall be equal to HERCULITE Tempered Glass made of float glass as manufactured by PPG Industries, Inc. Thickness shall be 1/4" unless otherwise noted on the drawings.
- E. Glass for mirror shall be silver backed 1/4" polished plate glass. All edges shall be ground smooth and sealed.
- F. A 12" x 12" sample of each type of glass to be used shall be submitted to the Architect for approval prior to fabrication.
- G. Fire glass shall be required thickness, polished clear fire glass as manufactured by TGP. Fire glass shall comply with all U.L. requirements for glass in fire rated openings. Fire rating shall be as required on the drawings or by Code.
- H. Glazing sealant shall be Dow Corning 999 Silicone Building & Glazing Sealant or an approved equal. Color to be selected by Architect.

- I. Glazing tape shall be a closed cell, flexible, self-adhesive, non-extruding, polyvinyl chloride foam tape which is recommended by the manufacturer for exterior, exposed, watertight installation of glass. Tape shall conform to ASTM DI667.
- J. Miscellaneous glazing materials, such as neoprene setting blocks and spacers, compressible filler rods, cleaners, primers, sealers, etc. which are required for proper glazing operation shall be furnished. All miscellaneous glazing materials shall meet the requirements of the glass and glazing sealant manufacturers.

## PART THREE - EXECUTION

### 3.1 INSTALLATION

- A. Glass installation shall be watertight and airtight and must withstand normal temperature changes, wind loading and impact loading without failure of any kind including loss or breakage of glass, failure of sealants to remain watertight and airtight or deterioration of glazing materials or other defects in the work.
- B. Glass installation shall be in strict accordance with the combined recommendations of the glass and sealant manufacturers and the "Glazing Manual" by the Flat Glass Marketing Assoc.
- C. Glass installation shall not begin until the framing members are acceptable to the Glazing Contractor. Once acceptable, the framing shall be properly prepared for glazing by cleaning the channels, removing coating which will prevent proper bonding and applying primers and sealers as recommended by sealant manufacturer.

### 3.2 PROTECTION AND CLEANING

- A. Glass shall be protected from breakage by attachment of crossed streamer to framing. Markers shall not be applied to surface of glass. Glass which is broken, chipped, cracked, abraded, scratched or damaged shall be replaced.
- B. Glass shall be maintained in a reasonably clean condition during construction so that it will not be damaged by corrosive action and will not contribute to the deterioration of glazing materials and other work by wash-off.
- C. Glass shall be washed and polished on both faces not more than three days prior to Owner's acceptance. Washing and polishing shall be in accordance with manufacturer's recommendations.

### 3.3 TEMPERED GLASS

- A. Tempered glass shall be installed in all locations shown on the drawings, specified herein, and where required by Code.

### 3.4 FIRE-RATED ASSEMBLIES

- A. Fire glass shall be installed in all locations requiring fire rated assemblies. Installation shall comply with U.L. requirements for applicable fire rating.

END OF SECTION

## SECTION 09250 - GYPSUM DRYWALL

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the contract, including Division 1, General Requirements, apply to the work specified in this section.

#### 1.2 DESCRIPTION OF WORK

- A. The work required under this section consists of all gypsum drywall, metal stud framing, finishing and related items necessary to complete the work indicated on drawings and described in specifications
- B. Contractor shall be responsible for coordinating this work with all other trades to ensure the proper and timely completion of all required work

#### 1.3 REFERENCES

- A. ANSI/ASTM C36 – Gypsum Wallboard
- B. ANSI/ASTM C475 – Joint Treatment Materials for Gypsum Wallboard Construction
- C. ANSI/ASTM C645 – Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
- D. ANSI/ASTM C646 – Steel Drill Screws for the Application of Gypsum Sheet Material to Light Gauge Steel Studs.
- E. ANSI/ASTM C754 – Installation of Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water Resistant Backing Board.
- F. ANSI/ASTM E119 – Fire Tests of Building Construction and Materials.
- G. FS HH-I-521 – Insulation Blankets, Thermal (Mineral Fiber, for Ambient Temperatures).
- H. GA-201 – Gypsum Board for Walls and Ceilings.
- I. GA-216 – Recommended Specifications for the Application and Finishing of Gypsum Board.

#### 1.4 JOB CONDITIONS

- A. In cold weather, and during the period of wallboard application and joint finishing, temperatures within the building shall be maintained uniformly within the range of 55 degrees and 70 degrees F. Adequate ventilation shall also be provided to eliminate excessive moisture within the building during the same period.

## 1.5 INSPECTION OF SURFACES

- A. Surfaces to receive gypsum wallboard shall be examined for defects which might impair the quality of finished installation and work shall not be started until such defects have been corrected. All framing members to which gypsum wallboard will be fastened shall be straight and true and spaced not to exceed 16" o.c. for walls and 24" o.c. for ceilings. Framing and bridging members should be adequate to carry the design or code loading. The fastening surface of any framing or furring member should not vary more than 1/8" from the plane of the faces of adjacent framing or furring members.
- B. Backblocking and framing should be provided as necessary for the support of fixtures, hardware, accessories, etc., conduit, piping and other items to be concealed by or penetrating, wallboard shall be installed before applying wallboard.

## 1.6 DELIVERY, HANDLING AND STORAGE

- A. All materials shall be delivered in the original packages, containers or bundles bearing the brand name and name of the manufacturer or supplier for whom the product is manufactured. Wallboard delivered prior to use shall be stored within a completely enclosed weather-tight covering. Wallboard shall be neatly stacked flat, with care taken during handling and storage to avoid undue sagging or damage to edges, ends and surfaces. Application shall commence only after the structure is completely weather-tight.

# PART TWO - PRODUCTS

## 2.1 MANUFACTURERS

- A. Materials specified herein are those manufactured by the United States Gypsum Company. Similar and equal materials furnished by National Gypsum Company or John-Mansville will be acceptable.

## 2.2 WAALBOARD, FASTENER, TRIM, TAPE, TREATMENT, ETC.

- A. Fire-Rated Wallboard shall be furnished in 48" widths, in lengths as great as practicable to minimize number of joints and shall conform to the ASTM C-36 Type X, 5/8" thick with tapered edges "Sheetrock Brand Firecode C Core" or an approved equal.
- B. Non-Fire Rated Wallboard shall be 48" widths, in lengths as great as possible to minimize number of joints and shall conform to ASTM C-36, 1/2" thick with tapered edges, "sheetrock Brand" or an approved equal. Wallborad for ceilings shall be 5/8" thick.
- C. Screws for attachment of single layer wallboard to metal studs and framing shall be 1" Type S bulge head for light gage framing and 1" Type S-12 bulge head for heavy gage framing.
- D. Screws for attachment of double layer wall board to metal studs and framing shall be 1 5/8" Type S bulge head for light gage framing and 1 5/8" Type S-12 bulge head for heavy gage framing.
- E. Corner beads and metal trim shall be made from galvanized steel, not lighter than 0.0217" nominal thickness, in the following shapes and sizes:



1. Corner beads for all external corners shall be No. 103 Dur-A-Bead.
  2. Metal trim (casing beads) shall be USG 200-A Series Perf-A-Trim, sized for wallboard thickness.
  3. Cold roll channels shall be 3/4", 16 gage steel.
- F. Tape shall be Perf-A-Tape. Compound for embedding and fill coat application shall be Perf-A-Joint Compound. Compound for finishing shall be Perf-A-Tape Topping Compound.
- G. Caulking compound shall be Presstite Plastic Sealer No. 579.64.

### 2.3 FRAMING MATERIALS

- A. Studs and tracks for non-structural partitions shall be 3 5/8" x 25 gauge galvanized (G90) sheet steel "C" shape members conforming to GA 201 and GA 216.
- B. Fasteners, furring, framing and accessories shall conform to GA 201 and GA 216.

## PART THREE - EXECUTION

### 3.1 METAL FRAMING INSTALLATION

- A. Metal framing shall be installed in accordance with GA 201 and GA 216. Studs shall be 16 inches on center and shall be screwed to each leg of the track.

### 3.2 GYPSUM BOARD INSTALLATION

- A. Gypsum board shall be installed in accordance with GA 201 and GA 216.
- B. Erect fire rated gypsum board vertically with edges and ends occurring over firm framing. Installation shall conform to U.L. requirements for applicable rating.
- C. Screws shall be used for fastening gypsum board to metal framing and furring. Space all fasteners in accordance with GA 201 and GA 216.
- D. All exposed joints, edges and corners shall be taped and filled.

END OF SECTION

## SECTION 09300 – CERAMIC TILE

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Division 1, General Requirements, apply to the work specified in this section.

#### 1.2 DESCRIPTION OF WORK

- A. Work covered by this section consists of the furnishing and installation of all ceramic tile work and related items as indicated on the drawings and as specified herein.

#### 1.3 SUBMITTALS

- A. Two (2) samples of each type, pattern, texture and color of tile shall be submitted to the Architect for color selection. Samples of trim and accessories shall be submitted if requested.

### PART TWO - PRODUCTS

#### 2.1 MATERIALS

- A. Ceramic tile shall be equal to the following American Olean products.
- B. Ceramic tile floors shall be 2" x 2" x 1/4" unglazed mosaics tiles with color throughout the body.
- C. Ceramic tile for base shall be 2" x 2" x 1/4" unglazed built-up tiles matching the floor tiles. Base shall be 6" high.
- D. Ceramic tile for walls shall be 2" x 2" x 1/4" glazed ceramic tile to align with floor and base.
- E. Matching trim shall be provided for all tile work. Trim pieces shall be at inside and outside corner, edges, caps and all other locations required for proper installation.
- F. Thresholds shall be fabricated of marble selected by the Architect. Thresholds shall comply with ADA requirements.
- G. Portland Cement shall conform to ASTM C-150 type 1 waterproof or with a waterproof admixture.
- H. Sand shall conform to ASTM C-144.
- I. Mortar shall be made with one part Portland Cement and six parts sand. Cement shall be waterproof or with a waterproof admixture.
- J. Grout shall be made with one part Portland Cement and one part sand and other required ingredients to produce a water resistant, dense, uniformly colored grout.

- K. Bond shall be a Portland Cement paste.
- L. Hydrated lime shall conform to ASTM C-206 Type S or ASTM C-207 Type S.
- M. Latex-Portland Cement Grout for wall tiles shall conform to ANSI A108.10.
- N. Sealant shall be an approved one-part mildew-resistant silicone sealant formulated for sealing ceramic tile.

### PART THREE - EXECUTION

#### 3.1 INSTALLATION

- A. All tile work shall be installed, grouted, cleaned protected and cured in strict accordance with the manufacturer's recommendations, ANSI Standard Specification-A108 and the Handbook for Ceramic Tile Installation published by Tile Council of America.
- B. All floor tile shall be thin-set using Latex-Portland Cement Mortar in accordance with Specification F-113/F122.
- C. All base and wall tiles shall be thin-set using Latex-Portland Cement Mortar in accordance with Specification W202.
- D. Expansion joints shall be installed over all joints in floor slabs and in all other locations recommended by manufacturer and Tile Council of America. Expansion joints shall be in accordance with Specification E1 171. Location of all expansion joints shall be shown on shop drawings and shall be submitted for Architects review.

END OF SECTION

## SECTION 09500 - ACOUSTICAL TILE CEILING

### PART ONE – GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Division 1, General Requirements, apply to the work specified in this section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered by this section consists of furnishing all equipment, labor and materials necessary to satisfactorily complete the acoustical tile ceilings and related work as indicated on the drawings and as specified herein.

#### 1.3 SUBMITTALS

- A. Submit product data, manufacturer's product specifications and installation instructions for each acoustical ceiling material required, and for each suspension system, including certified laboratory test reports and other data as required to show compliance with these specifications.
- B. Samples: Submit a set of 12" square samples for each acoustical unit required, showing full range of exposed color and texture to be expected in completed work. Submit set of 12" long samples of each exposed runner and molding.

#### 1.4 MAINTENANCE STOCK

- A. At time of completing installation, deliver a stock of ceiling tiles to Owner. Furnish full size units matching units installed, packaged with protective covering for storage, and identified with appropriate labels. Furnish an amount equal to 2.0% of acoustical units installed.

### PART TWO – PRODUCTS

#### 2.1 MATERIALS

- A. Acoustical tile for Corridors, Halls and Entries shall be equal to Armstrong Fissured Angled Teqular Medium Texture Number 705, 24" x 24" x 5/8" for 15/16" grid.
- B. Acoustical tile for other areas shall be equal to Armstrong Fissured Square-edge Lay-in Medium Texture Number 756, 24" x 24" x 5/8" for 15/16" grid.
- C. Grid for Acoustical Tile Ceilings shall be equal to Armstrong Prelude 15/16" Exposed Tee System.
- D. See Alternates Section 01014.

### PART THREE - EXECUTION

### 3.1 INSTALLATION

- A. Do not install interior acoustical ceilings until space is enclosed and weather proof, and until wet - work in space is completed and is nominally dry, and until work above ceilings is completed, and until ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.
- B. Installer must examine conditions under which acoustical ceiling work is to be performed and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.
- C. Furnish layouts for inserts, clips or other supports required to be installed by other trades for support of acoustical ceilings. Refer to Reflected Ceiling Plan for layout of suspension system. At all locations where layout requires tiles less than 4" width Contractor shall consult with Architect prior to installing suspension system. System shall be shifted or adjusted as directed by Architect.
- D. Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire resistance rating requirements as indicated, and industry standards applicable to work.
- E. Install suspension systems to comply with ASTM C636, with hangers supported only from building structural members. Locate hangers near each end and spaced 4' - 0" along each carrying channel or direct - hung runner, unless otherwise indicated, leveling to tolerance of 1/8" in 12" - 0". Secure wire hangers by looping and wire - tying, either directly to structures or to inserts, eye - screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperature. Install edge moldings at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units. Screw attach moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12" - 0". Miter corners accurately and connect securely.
- F. Install hanger within 12" of all corners of light fixtures and HVAC diffusers. All fixtures and diffusers shall be supported by a minimum of two (2) hangers independent of the ceiling system.
- G. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations. Double cut and field paint exposed edges or beveled regular panels.
- H. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

## **SECTION 09650 - FLOOR COVERING**

The Owner shall provide all vinyl composition tile flooring and rubber base work for this project under a separate contract. This shall include the removal of all existing VCT carpet and rubber base and the preparation of the floor slab for new flooring.

## **SECTION 09900 – PAINTING**

### **PART ONE - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. The General Provisions of the contract, including Division1, General Requirements, apply to the work specified in this section.

#### **1.2 DESCRIPTION OF WORK**

- A. The work covered by this consists of the furnishing of all labor, materials and equipment required to satisfactorily complete the painting and related items as indicated on the drawings and as specified herein.

#### **1.3 SUBMITTALS**

- A. Contractor shall submit product data, manufacturer's product specifications and installation instructions for each type of paint, including certified laboratory test reports and other data as required to show compliance with these specifications.
- B. Contractor shall submit two (2) sets of color samples to the Architect for color selections.

### **PART TWO - PRODUCTS**

#### **2.1 MATERIALS**

- A. All materials shall be first quality. Materials listed shall be standard for each type of material. Approved equal products by Coronado, Pittsburgh, Glidden, Benjamin Moore or other approved manufacturer will be accepted.
- B. Exterior metal, miscellaneous iron and other ferrous metal work shall have the shop or prime coat touched up or if not primed, they shall be primed with Sherwin Williams Kem Kromik Universal Metal Primer B50z. Finish coat shall be two (2) coats of Sherwin Williams Direc-to-Metal Enamel - B55.
- C. All exterior and interior galvanized metal shall be primed with one (1) coat of Sherwin Williams Galvite HS-B50 and finished with two (2) coats Sherwin Williams Direct-to -Metal Enamel-B55.
- D. Interior metal doors and frames, miscellaneous iron and other ferrous metal work shall have stop or primer coat touched up or it not primed, they shall be primed with Sherwin Williams Kem Kromik Universal Metal Primer B50Z. Finish coats shall be two (2) coats of Sherwin Williams Pro-Mar 200 Interior Alkyd Semi-Gloss Enamel.
- E. Interior wood doors shall be finished with stain and three (3) coats of Sherwin Williams Polyurethane Varnish.
- F. Exterior concrete, concrete block, brick and other similar materials shall be primed with two (2) coats of Sherwin Williams Heavy Duty Block Filler and finished with two (2) coats of Sherwin Williams A-100 Exterior Latex Gloss House and Trim Paint.

- G. Interior concrete and concrete block to be painted shall be primed with two (2) coats of Sherwin Williams Heavy Duty Blocker Filler and finished with two (2) of Sherwin Williams Pro-Mar 200 Interior Latex Semi-Gloss Paint.
- H. Gypsum board to be painted, shall be primed with one (1) coat of Sherwin Williams Pro-Mar 200 Latex Wall Primer and finished with two (2) coats of Sherwin Williams Pro-Mar 200 Interior Latex Semi-Gloss paint.
- I. Existing surfaces which have previously been painted, shall be cleaned and properly prepared to be repainted. Contractor shall test and verify compatibility of new paint with existing paint prior to beginning new work.
- J. Wood trim shall be primed with one (1) coat of Sherwin Williams Pro-Mar 200 Alkyd Enamel Under Coated and finished with two (2) coats of Sherwin Williams Pro-Mar 200 Interior Alkyd Semi-Gloss Paint.
- K. Accessory materials which are not specified shall be first quality and commercial grade and shall be approved by the painting manufacturer for use with his product.

## PART THREE - EXECUTION

### 3.1 APPLICATION

- A. All surfaces that are to be treated under this section of the specifications shall be properly prepared to receive paint, stain, etc. prior to beginning work. Surfaces shall be prepared in strict conformance with manufacturer's written instructions. All material applied under this section of the specifications shall be applied in strict conformance with the manufacturer's written instructions.
- B. All surfaces shall be cleaned of dirt, grease, glue, wallpaper paste, etc. All cracks, nails, holes, etc. shall be filled prior to painting. All imperfections in wall finishes shall be corrected by wall finisher prior to application of finish paint.
- C. Dry thickness of paint shall be in accordance with manufacturer's paint instructions. Where coverage is not satisfactory to the Architect, the painting Contractor shall apply additional coats or shall have an independent testing laboratory verify that the materials and application are in compliance with the manufacturer's instructions and these specifications. The painting Contractor shall pay all cost of testing.
- D. Finish on doors, frames, trim and millwork shall be applied by spraying. Other paints may be applied by spray, brush or roller.

### 3.2 COLORS AND SAMPLES

- A. All colors shall be selected by the Architect. After selection, the Contractor shall apply paint and stain to a sample material and submit it to the Architect for approval prior to beginning painting work.

### 3.3 MAINTENANCE STOCK



- A. At the completion of the work, the Contractor shall deliver to the Owner a one (1) unopened gallon of each color and type paint used. Each container shall be labeled with the color, type and room locations in addition to the manufacturer's label.

END OF SECTION

## SECTION 10000 – SPECIALTIES, MISCELLANEOUS FURNISHINGS, FIXTURES AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the contract, including Divisions 1, General Requirements, apply to the work specified in this section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered by this section consists of furnishing all equipment, labor and materials necessary to satisfactorily complete the specialties, miscellaneous furnishings, fixtures and equipment as indicated on the drawings and as specified herein.

#### 1.3 SUBMITTALS

- A. The Contractor shall submit manufacturer's data and specifications, shop drawings and any other information which may be required to ensure compliance with these specifications.

### PART 2 - PRODUCTS

#### 2.1 SPECIALTIES, FURNISHINGS, FIXTURES AND EQUIPMENT

- A. Fire Extinguishers and Cabinets: Contractor shall furnish and install fire extinguishers and recessed cabinets at locations shown on the drawings. Fire extinguishers shall be equal to Larsen MP10. Cabinets shall be equal to Larsen 2409-R2. Cabinets shall be Architectural Series with solid door and vertical die cut lettering. Cabinets shall have aluminum doors and trim and shall be installed at locations directed by the Architect.
- B. Toilet Partitions: Contractor shall furnish and install plastic laminate toilet partitions as shown on the drawings. Partitions shall be equal to Bobrick 1042 Designer Series, Overhead Braced, complete with all hardware and accessories required for proper installation and function. Urinal screens shall be floor anchored 1041 Designer Series. Toilet partition doors shall have latches and combination bumpers and coat hooks.
- C. Wall Louvers: Contractor shall furnish and install metal wall louvers and wall caps as indicated on the drawings. Louvers and caps shall be equal to Construction Specialties Model RS-7305, complete with sill flashing and screens. Louvers and caps shall be sized as shown or as required by equipment manufacturer. Finish shall be equal to Kynar 500 with color selected by Architect.
- D. Toilet Accessories: Contractor shall furnish and install toilet accessories as shown on the drawings and as specified herein. Contractor shall install wood blocking as required to anchor accessories. Install toilet accessories as directed by Architect. Toilet accessories shall be equal to the following Bradley products:

## FINE ARTS BUILDING

### Boys

3 Tissue Holders	Model 5224
3 Electric Hand Dryers	Model 2875-48
4 Mirrors - 18" x 36"	Model 781
1 Grab Bar 36"	Model 800-001
1 Grab Bar 54"	Model 800-002

### Girls

3 Tissue Holders	Model 5224
1 Napkin/Tampon Vendor	Model 4017
3 Napkin Disposals	Model 4721-15
3 Electric Hand Dryers	Model 2875-48
4 Mirrors - 18" x 36"	Model 781
1 Grab Bar 36"	Model 800-001
1 Grab Bar 54"	Model 800-002

### Men

1 Tissue Holder	Model 5224
1 Electric Hand Dryer	Model 2875-48
2 Mirrors - 18" x 36"	Model 781
1 Grab Bar 36"	Model 800-001
1 Grab Bar 54"	Model 800-002

### Ladies

2 Tissue Holders	Model 5224
1 Napkin/Tampon Vendor	Model 4017
1 Napkin Disposal	Model 4721-15
1 Electric Hand Dryer	Model 2875-48
2 Mirrors - 18" x 36"	Model 781
1 Grab Bar 36"	Model 800-001
1 Grab Bar 54"	Model 800-002

## SCIENCE AND ARTS BUILDING

### Boys 1

3 Tissue Holders	Model 5224
3 Electric Hand Dryers	Model 2875-48
4 Mirrors - 18" x 36"	Model 781
1 Grab Bar 36"	Model 800-001
1 Grab Bar 54"	Model 800-002
2 Grab Bars 42"	Model 800-001

### Girls 1

5 Tissue Holders	Model 5224
1 Napkin/Tampon Vendor	Model 4017
2 Napkin Disposals	Model 4721-15
1 Napkin Disposal	Model 4731-15
4 Electric Hand Dryers	Model 2875-48
5 Mirrors - 18" x 36"	Model 781
1 Grab Bar 36"	Model 800-001
1 Grab Bar 54"	Model 800-002
2 Grab Bars 42"	Model 800-001

### Staff Toilet 1

1 Tissue Holder	Model 5224
1 Electric Hand Dryer	Model 2875-48
1 Mirror - 18" x 36"	Model 781
1 Grab Bar 36"	Model 800-001
1 Grab Bar 54"	Model 800-002

### Staff Toilet 2

1 Tissue Holder	Model 5224
1 Napkin/Tampon Vendor	Model 4017
1 Napkin Disposal	Model 4731-15
1 Electric Hand Dryer	Model 2875-48
1 Mirror - 18" x 36"	Model 781
1 Grab Bar 36"	Model 800-001
1 Grab Bar 54"	Model 800-002

### Boys 2

(Same as Boys 1)

### Girls 2

(Same as Girls 2)

### Teachers Toilet 1

1 Tissue Holder	Model 5224
1 Electric Hand Dryer	Model 2875-48
1 Mirror - 18" x 36"	Model 781
1 Grab Bar 36"	Model 800-001
1 Grab Bar 54"	Model 800-002
1 Napkin/Tampon Vendor	Model 4017
1 Napkin Disposal	Model 4731-15

### Teachers Toilet 2

1 Tissue Holder	Model 5224
1 Electric Hand Dryer	Model 2875-48
1 Mirror - 18" x 36"	Model 781

- E. Building Plaques: Contractor shall furnish and install building plaque. Plaque shall be painted cast aluminum equal to Andco. Plaque shall be 30" wide x 24" high. Pebble field texture, 1" flat brushed border and concealed stud mounting. Lettering shall be Claredon style, upper and lower case with text as shown on ABC For C-16. Contractor shall provide full size rubbing for approval.
- F. Marker Boards, Tack Boards and Map Rails: Contractor shall furnish and install marker and tack board along with map rails in all areas shown on the drawings. Marker boards and tack boards shall have continuous map rails at top and chalk trays at bottom, both full length. Units shall be equal to Claridge Series I Factory Built Units. Marker Boards shall be 24-gage porcelain enamel steel sheet outerface, 3/8" particleboard core and metal foil backing. Map rail shall be 2" wide continuous cork integral with rail complete with end stops, two (2) map hooks for each four (4) feet of rail and one (1) flagholder for each room. Tack boards shall be vinyl fabric faced fiberboard, 1/2" thick, 3/8" thick particleboard core and metal foil backing. Frames and trim shall be extruded aluminum with natural mill finish. Chalk tray shall be full length with molded end closures and concealed fasteners.
- G. Projection Screens: Contractors shall furnish and install projection screen in all areas as shown on the drawings. Projection screens shall be equal to Da-Lite Model C, 54" x 96", High Contrast Matte White viewing surface, wall mounted with Controlled Screen Return.

## PART THREE - EXECUTION

### 3.1 INSTALLATION

- A. All specialties, furnishings, fixtures and equipment shall be installed in accordance with manufacturer's instructions. Verify locations with Architect.
- B. All units shall be securely installed, level and plumb with concealed fasteners.

### 3.2 CLEANING

- A. Clean all surfaces in accordance with manufacturer's instructions and leave ready for Owner's use.

END OF SECTION

## SECTION 10010 – LABORATORY AND CLASSROOM ACCESSORIES

### PART ONE - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. The General Provisions of the contract, including Divisions 1, General Requirements, apply to the work specified in this section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered by this section consists of furnishing all accessories, labor and materials necessary to satisfactorily complete the Laboratory and Classroom Accessories as indicated on the drawings and as specified herein.

#### 1.3 SUBMITTALS

- A. The Contractor shall submit manufacturer's data and specifications, shop drawings and any other information which may be required to ensure compliance with these specifications.

### PART TWO - PRODUCTS

#### 2.1 ACCESSORIES

- A. Four Student Science Tables shall be equal to Leonard Peterson & Co., B-747-DX, 4' -8" x 4'-8" with 1" black epoxy resin top, 12" diameter epoxy resin sink with outlet, 2 cold water faucets, 4 gas cocks, 2 GFI duplex electric receptacles, 4 rod sockets and 4 DX drawer units.
- B. General Science Wall Service Unit shall be equal to Leonard Peterson & Co., B-580-KK, 7'-6" x 2'-0" with 1" black epoxy resin top, 16" x 12" x 8" epoxy resin sink with outlet, 1 cold water faucet, 2 gas cocks, 2 GFI duplex electric receptacles, sink base cabinet and two 4drawer and one cabinet base.
- C. Instructor's Desk shall be equal to Leonard Peterson & Co., B-1010 with 1" black epoxy resin top, 18" x 15" x 8" epoxy resin sink with outlet, 1 hot and cold water missing faucet, 2 gas cocks, 1 GFI duplex electric receptacle, 1 data box with blank cover plate, 1 removable crossbar rod assembly and 1 master key lock on drawer.
- D. Instructor's Desk same as Item C above except with 2 gas cocks.
- E. Perimeter Type Student Tables shall be equal to Leonard Peterson & Co., B-500-K8K, 7'-6" x 7'-6" with 1" black epoxy resin top, 12" x 8" x 6" epoxy resin sink with outlet, 2 cold water faucets, 4 gas cocks, 4 GFI duplex electric receptacles, 2 removable crossbar rod assemblies, two K8 drawer and cabinet base units and two K drawer and cabinet base units. All drawers shall have individually keyed master keyed locks.
- F. ADA Laboratory Fume Hood shall be equal to BMC B-9850, 60" Air foil Assemblies with two standard base cabinets, knee space, two FL 35-7 filler panels, dished epoxy resin countertop, F-400, 3" x 6" epoxy resin cupsink, three F-100 light switch, F-110 cold water fixtures, F-200 light switch, F-210 blower switch, two F-220 110V duplex receptacles, 150 FPM/850 CFM/.21 S.P. exhaust fan.

## PART THREE - EXECUTION

### 3.1 INSTALLATION

- A. All Laboratory and Classroom Accessories shall be installed and connected in accordance with manufacturer's instructions and shall be left ready for use by the Owner.

END OF SECTION

## SECTION 14240 – HYDRAULIC ELEVATOR

### 1. RELATED DOCUMENTS

- 1.1 The General Provision of the contract, including Division 1, General Requirements, apply to the work specified in this section.
- 1.2 The following sections contain requirements that relate to this section and are performed by other trades.
  - A. Section 02200 – Earthwork: excavation for pit.
  - B. Section 03300 – Cast-In-Place Concrete: elevator pit, elevator motor and pump foundation and grouting thresholds.
  - C. Section 04200 – Unit Masonry: masonry hoistway enclosure, building-in and grouting hoistway door frames, grouting thresholds.
  - D. Section 05500 – Metal Fabrication: pit ladder, divider beams, support for entrance and rails, hoisting beam at top of hoistway.
  - E. Section 15700 – Heating, Ventilating and Air Conditioning: ventilation and temperature control of elevator equipment room.
  - F. Section 16100 – Electrical: electrical service to main disconnect in elevator machine room; electrical power for elevator installation and testing; electrical-disconnecting device to elevator equipment prior to activation of sprinkler system; electrical service for machine room; machine room and pit receptacles with ground-fault current protection; lighting in machine room and pit; wiring for telephone service to machine room.

### 2. REFERENCES

- 2.1 Comply with applicable building codes and elevator codes at the project site; including but not limited to the following:
  - A. ANSI A117.1, Building and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
  - B. ADAAG, Americans with Disabilities Act Accessibility Guidelines.
  - C. ANSI/NFPA 70, National Electrical Code.
  - D. ANSI/FNPA 80, Fire Doors and Windows.
  - E. ASME/ANSI A17.1, Safety Codes for Elevators and Escalators.
  - F. ANSI/UL 10B, Fire Test of Door Assemblies.
  - G. All other local applicable codes.



### 3. DESCRIPTION OF WORK

3.1 The work covered by this section consists of furnishing and installation of Hydraulic Elevator and related items as indicated on the drawings as specified herein.

A. Elevator No. 1:

Type: Holeless Hydraulic – Otic LVM 2000L  
Stops: 2 Front  
Openings: 1 Front  
Rise: 14'-0"  
Capacity and Speed: 2,000 lbs. @ 100/125 F.P.M.  
Minimum Car Inside: 5'-8" wide x 4'-3" Deep  
Inside Car Height: 8'-0"  
Entrance Width and Type: Center Open Doors 3'-6" x 7'-0"

B. Power Supply: Verify with Electrical Contractor.

C. Stopping Accuracy: +/- 1/4" under any loading condition or direction of travel.

D. Door Opening Time: 2.5 seconds for center opening 42" door.

E. Simplex Collective Operations: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

F. Provide microprocessor-based control system, which utilizes on-board diagnostics for servicing, trouble-shooting and adjusting without requiring the use of an outside service tool. If an on-board diagnostic system is not provided, a handheld service tool (or laptop), owner's license, operation manual and tool instructions must be provided in addition to the control system.

G. Car Operating Features:

1. Full Collective Operation
2. Single Speed Fan
3. On/Off Light Switch
4. Solid State Starting
5. Remote Elevator Monitoring REM® Ready
6. Car-Stall Protection
7. Firefighters' Service Phase 1 and Phase 11
8. Top of Car Inspection
9. Door Operation
10. Full Selective Operation
11. Semi-Selective Operation
12. Access at Bottom Landing

H. Door Control Features

Closed Loop Door Operator is a closed loop, microprocessor based door operator system. The door operator will facilitate smooth operation under varying environmental influences such as temperature, wind, friction and component variation. The processor will monitor

the door's actual position and velocity compared to its desired position and velocity. If variations are detected in the profile, the command will be automatically corrected. The Closed Loop Door Operator control system shall not require machine room door control equipment.

2. Door noise not to exceed 58dBA.
3. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.
4. Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person.

Primary door protection shall consist of a two dimensional, multi-beam array projecting across the car door opening. Under normal operation and for any door position, the system shall detect as a blockage an opaque object that is equal to or greater than 1.3 inches in diameter when inserted between the car doors at vertical positions from within 1 inch above the sill to 71 inches above the sill. Under degraded conditions (one or more blocked or failed beams), the primary protection shall detect opaque objects that are equal to or greater than 4" in diameter for the same vertical coverage. If the system performance is degraded to the point that the 4" object cannot be detected, the system shall maintain the doors open or permit closing only under nudging force conditions.

The door reopening device shall also include a secondary, three dimensional, triangular infrared multi-beam array projecting across the door opening and extending into the hoistway door zone. The door-opening device will cause the doors to reopen when it detects a person(s) or object(s) entering or exiting the car in the area between the hoistway doors or the entryway area adjacent to the hoistway doors.

The size of the secondary protection zone shall vary as the door positions vary during opening and closing. The width of the zone shall be approximately one-third the size of the separation between the doors (or door and strike plate for single-slide doors) and shall be approximately centered in the door separation. In order to minimize detection of hallway passersby who are not entering the elevator, the maximum zone penetration into the hallway shall not exceed 20" for any door separation. Normal penetration depth into the entryway from the car doors shall be ~14" for a door separation of 42. The penetration shall reduce proportionally as the doors close. At door separation of 18" or less, the secondary protection system may cease its normal operation since the depth of the zone receded to where it is inside the hoistway doors. The vertical coverage of the secondary protection shall be ~19" above the sill to ~55" above the sill (mid-thigh to shoulder of a typical adult).

The secondary protection shall have an anti-nuisance feature that will ignore detection in the secondary zone after continual detection occurs for a significant time period in the secondary zone without corresponding detection in the primary protection zone, i.e. a person/object is in the entryway but does not enter. Normal secondary protection shall be re-enabled whenever a detection occurs in the primary zone.

The reaction time of the door detector sub-system shall not exceed 60 milliseconds when both primary and secondary protection capabilities are active; nor 40 milliseconds when the secondary protection is disabled.

5. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

#### 4. SUBMITTALS

- 4.1 Product Data: Submit manufacturer's product data for each system proposed for use. Include the following:

1. Signal and operating fixtures, operating panels and indicators.
2. Cab design, dimensions and layout.
3. Hoistway-door and frame details.
4. Electrical characteristics and connection requirements.
5. Expected heat dissipation of elevator equipment in machine room (BTU).

- 4.2 Shop Drawings: Submit approved layout drawings. Include the following:

1. Car, guide rails, buffers, and other components in hoistway.
2. Maximum rail bracket spacing.
3. Maximum loads imposed on guide rails requiring load transfer to building structure.
4. Loads on hoisting beams.
5. Clearance and travel of car.
6. Clear inside hoistway and pit dimension.
7. Location and size of access doors, hoistway entrance and frames.

- 4.3 Operations and Maintenance Manuals: Provide manufacturer's standard operations and maintenance manual.

#### 5. QUALITY ASSURANCE

- 5.1 Manufacturer: Provide elevator manufactured by a firm with a minimum of 10 years experience in fabrication of elevators equivalent to those specified. Elevator manufacturer shall be ISO9002 certified.

- 5.2 Installer: Elevator shall be installed by the manufacturer.

- 5.3 Regulatory Requirements: Elevator system design and installation shall comply with the latest version of ASME A17.1 elevators shall be designed in response to Americans with Disabilities Act Accessibility Guidelines (ADAAG).

- 5.4 Permits and Inspections: Provide licenses and permits and perform required inspections and tests.

#### 6. DELIVERY, STORAGE AND HANDLING

- 6.1 Should the building or the site not be prepared to receive the elevator equipment at the agreed upon date, the General Contractor will be responsible to provide a proper and suitable storage area on or off the premises.

Should the storage area be off-site and the equipment not yet delivered, then the elevator contractor, upon notification from the General Contractor, will divert the elevator equipment to the storage area. If the equipment has already been delivered to the site, then the General Contractor shall transport the elevator equipment to the storage area. The cost of the elevator equipment taken to storage by either party, storage and redeliver to the job site shall not be at the expense of the elevator contractor.

## 7. WARRANTY

- 7.1 The elevator contractor's acceptance is conditional on the understanding that their warranty covers defective material and workmanship. The guarantee period shall not extend longer than one (1) year from the date of completion or acceptance thereof by beneficial use, whichever is earlier, of each elevator. The guarantee excludes ordinary wear and tear or improper use, vandalism, abuse, misuse, or neglect or any other causes beyond the control of the elevator contractor and this express warranty is in lieu of all other warranties, express or implied, including any warranty of merchantability or fitness for a particular purpose.

## 8. MAINTENANCE SERVICE

- 8.1 Maintenance service consisting of regular examinations, adjustments and lubrication of the elevator equipment shall be provided by the elevator contractor for a period of twelve (12) months after the elevator has been turned over for the customer's use. The service shall not be subcontracted but shall be performed by the elevator contractor. All work shall be performed by competent employees during regular working hours of regular working days and shall include emergency 24-hour callback service. This service shall not cover adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the elevator contractor. Only genuine parts and supplies as used in the manufacture and installation of the original equipment shall be provided.

## 9. ACCEPTABLE MANUFACTURER

- 9.1 Provide hydraulic elevators by Otis Elevator Company or approved equal.

## 10. EQUIPMENT: MACHINE ROOM COMPONENTS

- 10.1 The hydraulic system shall be of compact design suitable for operation under the required pressure. The power component shall be mounted in the hydraulic-fluid storage tank. The control valve shall control flow for up and down directions hydraulically and shall include an integral check valve. A control section including control solenoids shall direct the main valve and control: up and down starting, acceleration, transition from full speed to leveling speed, up and down stops, pressure relief and manual lowering. All of these functions shall be fully adjustable for maximum smoothness and to meet contract conditions. System to be provided with a muffler, lower pressure switch and a shut off valve.
- 10.2 A microprocessor-based controller shall be provided, including necessary starting switches together with all relays, switches, solid-state components and hardware required for operation, including door operation, as directed herein. A three (3) phase overload device shall be provided to protect the motor against over-loading.
- 10.3 A manual lowering feature shall permit lowering the elevator at slow speed in the event of power failure or for adjusting purposes.

- 10.4 Low-oil control.
- 10.5 Pressure switch.

## 11. EQUIPMENT: HOISTWAY COMPONENTS

- 11.1 Plunger(s) and Cylinder(s): Each cylinder shall be constructed of steel pipe of sufficient thickness and suitable for the operating pressure. The top of each cylinder shall be equipped with a cylinder head with a drip ring to collect any oil seepage as well as an internal guide ring and self-adjusting packing. Each plunger shall be constructed of selected steel tubing or pipe of proper diameter machined true and smooth with a fine polished finish. Each plunger shall be provided with a stop ring electrically welded to it to prevent the plunger from leaving the cylinder. Each plunger and cylinder shall be installed plumb and shall operate freely with minimum friction.
- 11.2 Car Guide Rails: Tee-section steel rails with brackets and fasteners.
- 11.3 Spring Buffer: Helical coil spring type.
- 11.4 Wiring: Wiring for hoistway electrical devices included in scope of the elevator system, hall panels, pit emergency stop switch, and the traveling cable for the elevator car.
- 11.5 Hoistway Entrance:
  - 1. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angels mounted in the hoistway and shall be of 14 gauge sheet steel. Sills shall be extruded.
  - 2. Doors: Entrance doors shall be of hollow metal construction with vertical internal channel reinforcements.
  - 3. Fire Rating: Entrance and doors shall be UL fire rated for 1 ½ hour.
  - 4. Entrance Finish: All entrances shall be satin finish stainless steel except basement, which shall be powder paint. Frames and doors shall be satin finish stainless steel.
  - 5. Entrance Markings: Entrance jambs shall be marked with 4"x4" plates having raised floor markings with Braille adjacent. Markings shall be provided on both sides of the entrance.
  - 6. Sight Guards: Black sight guards will be furnished with any metal finish door. Powder paint matching sight guards will be furnished with powder paint doors.

## 12. EQUIPMENT: CAR COMPONENTS

- 12.1 Car Frame: A suitable car frame shall be provided with adequate bracing to support the platform and car enclosure. The buffer striking plate on the underside of the car-frame platform assembly must fully compress the spring buffer mounted in the pit before the plunger reaches its lower limit of travel.
- 12.2 Platform, Heavy Loading Type: The car platform shall be arranged to accommodate one-piece loads weighing up to 25% of the rated capacity, such as wheeled food carts, stretchers, x-ray equipment, etc. The platform shall be recessed 5/16" for flooring by others.

- 12.3 Removable Panels: Cab walls to be of 16-gauge sheet steel painted with black powder paint and are to have perforations for hardware to mount removable panels. Laminate to be chosen from the manufacturer's standard selection.
- 12.4 Car Front Finish: Car front and door finish (and rear at rear opening elevator) shall be satin finished stainless steel.
- 12.5 Car top to be of wood material clad on both sides with a natural finish aluminum panel.
- 12.6 Ceiling Type: Aluminum Eggcrate [DC22E Ceiling] suspended ceiling shall consist of aluminum eggcrate diffusers set in frame of extruded aluminum with fluorescent lighting fixtures.
- 12.7 Emergency Car Lighting: An emergency power unit employing a 6 volt, sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car and provide current to the emergency siren in the event of building power failure.
- 12.8 Emergency Pulsating Siren: Siren mounted on top of the car that is activated when alarm button is the car-operating panel is engaged. Siren shall have a rated sound pressure level of 80 dba at a distance of 3.0 m from the device. Siren shall respond with a delay of not more than 1 second after the switch or push button has been pressed.
- 12.9 Exhaust Fan: an exhaust fan shall be mounted on the car top.
- 12.10 Utility Outlet: a 125V 15 amperes utility outlet with ground-fault circuit-interrupter protection shall be furnished on top of the cab.
- 12.11 Handrails: Flat solid metal ¼" x 8" satin stainless steel provided on the sides and rear of the car enclosure.
- 12.12 Threshold: aluminum.
- 12.13 Car Floor Finish: Finish flooring shall be furnished and installed by Flooring Contractor.

13. EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- 13.1 Car-Operating Panel: A panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. Raised markings and Braille markings shall be provided for each push-button.
- 13.2 Car Fixtures: Satin Stainless Steel:
  - A. Applied car operating panel shall be furnished. It shall contain a bank of square mechanical illuminated buttons marked to correspond to the landings served, an emergency call button, door open and door close buttons, and switches for lights, inspection and the exhaust fan. The emergency call button shall be connected to a bell that serves as an emergency signal. All buttons to have both raised and Braille markings. LED (red) button illumination with 1/8" projecting target.
- 13.3 Car Position Indicator: A 16-segment, digital, vacuum fluorescent car position indicator shall be integral to the car-operating panel.
- 13.4 2-Row Car Operating Panel: An ADA compliant communication device shall be provided which has been designed in response to ADAAG requirements integral with car operating panel.

- 13.5 Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.
- 13.6 Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Raised markings shall be provided for each push button.
- 13.7 Fixture Finish: Satin stainless steel.
- 13.8 Landing Passing Signal: A chime bell shall sound in the car to tell a passenger that the car is either stopping at or passing a floor served by the elevator.

#### 14. EXECUTION

##### 14.1 Preparation:

- 1. Take field dimensions and examine conditions of substrates, support s and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

##### 14.2 Installation:

- 1. Installation of all elevator components except as specifically provided for elsewhere by others.

##### 14.3 Clean-up:

- 1. Elevator Contractor shall clean up all exposed surfaces and shall leave elevator in first class condition, ready for use by Owner.
- 2. If elevator is used by the Contractors for movement of materials or furnishing, etc, the elevator shall be recleaned before turning over to the Owner.

##### 14.4 Demonstration:

- 1. The elevator contractor shall make a final check of elevator operation with the Owner or Owner's representative present prior to turning elevator over for use. The elevator contractor shall determine that control system and operating devices are functioning properly.

END OF SECTION

## SECTION 15300 – FIRE SPRINKLER SYSTEMS

### PART one - GENERAL

- 1.1 General Requirements: Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, and Section 15010, General Mechanical Provisions, apply to this section.
- 1.2 Qualifications of Contractor: The system shall be installed by an approved Contractor, holding a current and valid Alabama State Fire Marshall's Permit as Certified Fire Protection Sprinkler Contractor, and with satisfactory experience on at least three equivalent projects.
- 1.3 Scope: Furnish all labor, material, equipment, design, service and supervision for and incidental to the installation of a sprinkler system in the Science and Arts Building. (Sprinkler system is not required in Fine Arts Building.) The system shall be installed complete, satisfactorily tested and approved, and left ready for operation.

The work includes, but is not necessarily limited to the following:

- A. Connections to the site underground fire line at the street and extension of lines into the building, including all necessary fees, permits, excavation, backfill, cutting and patching, flushing, testing, and corrosion protection.
  - B. Installation of sprinkler control valves, tamper and water-flow switches, drains and test connections.
  - C. Installation of a complete wet pipe sprinkler system throughout all finished areas of the work.
  - D. Installation of all other piping, fittings, hangers, sprinklers, valves drains, sleeves, escutcheons, devices and accessories required for complete system.
  - E. System Design - Contractor shall be responsible for the complete design and installation of fire protection sprinkler and standpipe system in accordance with all the applicable codes specified herein. Prior to beginning final design, the Contractor shall prepare a preliminary design package for review and approval by the Architects and Engineers. The preliminary design shall show the general location of major rises, distribution lines and valves, the approximate size of risers and major lines and the type of heads planned for each area. System design shall be conformed to all applicable requirements of NFPA ,Factory Mutual and Owner's Insurance Provider.
  - F. Coordination - It shall be the responsibility of the Contractor to install piping in such a manner as to conform to structure, avoid obstructions, and observe clearances without extra cost to the Owner.  
Prefabrication piping does not preclude coordination with other trades. Piping shall be offset, relocated, or resized; or other piping shall be furnished and installed as necessary to provide space for other trades. The Architect assumes no responsibility for coordination by review of shop drawings. If a conflict arises, it shall be the responsibility of the Architect to decide who has priority. The decision of the Architect shall be final. No ceiling heights shall be lowered because of limitations of space for mechanical equipment.
- 1.4 Work Not Included: Electric wiring, unless specified herein.



- 1.5 Codes, Ordinances and Regulations: All work shall be in accordance with local, state and federal laws, codes, rules, regulations and standards applicable to this particular class of work. Work shall also comply with the requirements of the Dothan Fire Department, the Owner's Insurance Underwriter, the State of Alabama Fire Marshal and National Fire Protection Association Standards No. 13-1996, 24-1992, and 101-1994, and Factory Mutual. Where later published editions of these referenced standards contain more stringent requirements, then the more stringent requirement shall apply. In each of the NFPA standards referred to, the advisory provisions contained in the appendices shall be considered to be mandatory, as though the word "shall" had been substituted for the word "should".
- 1.6 Shop Drawings: Within 60 days after award of contract, submit one sepia reproducible and 3 blue-line sets of shop drawings and calculations, and 6 sets manufacturer's descriptive literature on all equipment and materials, to the Architect for Review. At the same time submit drawings, calculations, and descriptive literature to the Dothan Fire Department, and the Owner's Insurance Underwriter and Factory Mutual. The Contractor shall make all modifications and/or additions required to obtain the approval of shop drawings without extra cost to the Owner. The Contractor shall deliver reviewed drawings and/or letters of comment from all above authorities to the Architect and obtain final approval of drawings before any work is begun.
- Shop drawings shall show in detail dimensioned piping, valves, sprinklers, alarms, drains, hangers, etc. and all items as required by Section 6.1.1.1 of NFPA-13, and this section of the specifications. Outline all lights, ductwork, structure, and other obstructions on shop drawings to show proper coordination of all work. Locations of lines and rows of sprinkler heads shall be indicated by dimensions to walls and/or structural members, and the relationship to lights, ceilings, HVAC equipment, etc. indicated. Provide separate reflected ceiling plan showing relationship of sprinklers and all other ceiling elements. As the work progresses, the drawings shall be coordinated with other trades and dimensions at the site verified. Drawings shall be revised as required by conditions at no additional cost to the Owner.
- 1.7 As-Built Drawings: Contractor shall maintain a set of drawings showing location and size of all piping, valves, and related items, both interior and exterior. On completion of work, Contractor shall provide a set of mylar reproducible transparencies corrected to show all changes and noted "As-Built Drawings" together with two sets of blue-line drawings to the Architect.
- 1.8 Site Inspection: Bidders shall visit the site of the work before submitting bids and satisfy themselves as to the nature and scope of the work to be done. The submission of a bid shall be taken as evidence that the bidder is aware of all existing conditions. Later claims for additional labor, materials or equipment required for any difficulties or obstruction encountered shall not be recognized.

## PART TWO – MISCELLANEOUS REQUIREMENTS

- 2.1 General Workmanship: In general, all piping shall be concealed above all ceilings. Exposed piping shall be permitted only in mechanical areas, pipe chases, and areas specifically noted on the drawings. Cut all piping accurately to measurements established at site and work into place without springing or forcing properly clearing all windows, doors and other openings. Cutting structural members for passage of pipe will not be permitted. Route all pipe through previously built-in sleeves. Ream all pipe to remove burrs. Make changes in direction and size with reducing fittings. Cap or plug open ends of pipe during installation to keep out foreign materials.

Refer to and carefully check the installation against all drawings and existing conditions, and note where walls, ceilings, beams and pipe shafts are furred or enclosed. Refer to and check with the contract drawings and existing conditions for the HVAC, plumbing and electrical work and work of other trades.

Install all piping to be concealed in ceiling or wall construction so as not to cause delay to other work, and to allow ample time for the necessary tests and approvals.

Install swing joints or expansion loops wherever necessary to allow for pipe expansion. Securely anchor pipes so that expansion can occur at these points.

All equipment shall be installed in strict accordance with the manufacturer's recommendations and with NFPA requirements.

- 2.2 Field Supervision: The Contractor shall have a responsible representative of his organization at the site of the work for coordination of the system installation with other trades as early as is required by the progress of the work. Details of proposed departures from approved shop drawings due to the field conditions shall be submitted to and receive written approval of the Architect prior to installation.

- 2.3 Layout of Heads: Areas without sprinklers shown shall have sprinklers spaced by the Contractor to meet NFPA and Factory Mutual requirements and these specifications. Alignment of heads within any room or area shall be within ½" and lines shall be parallel with or perpendicular to building walls and/or ceiling lines.

Position of sprinklers on ceilings shall be further adjusted as follows:

- A. Lay-In Tile Areas: Sprinklers shall be centered in ceiling tile. In tiles that are scored, sprinklers shall be centered in one of the individual panels produced by the scoring. Center of tile alignment shall be accomplished by field cutting two horizontal arm-over pipes to meet the desired location (where space permits, same may be accomplished by use of a return bend and a single diagonal field cut arm-over). Tolerance is 1/4".
- B. Plaster and gypsum board ceilings, where such occur suspended beneath the bottom-of-joint fire ceilings: Sprinklers shall align with and/or center between the centerline of other ceiling elements (lights, diffusers, etc.). Method of alignment shall be field cut arm-overs as outlined above. Tolerance is 1/4" from the centerline of and/or center between other ceiling elements.

Note: All arm-over and return bends necessary for above shall occur between fire ceiling and suspended ceiling.

- 2.4 Joining of Pipe and Fittings: Schedule 40 steel pipe shall be joined by screw joints in accordance with ANSI B2.1, by flanged joints, by shop-welded joints in accordance with the requirements of AS D10.0, level AR-3, or by mechanical grooved fittings or couplings. Grooves may be rolled or cut and they shall be dimensionally compatible with the coupling.

Light wall steel pipe shall be joined by shop-welded joints or by mechanical grooved fittings or couplings, as outlined above. Cut grooves shall not be used on light wall pipe.

- 2.5 Underground Installation: All underground piping shall be installed in accordance with NFPA-24. Depth of cover over piping shall be a minimum of 36". Joints shall be left exposed until all inspections and tests have been made.

Bends, plugs, tees, and hydrants shall be retained or blocked in accordance with the requirements of NFPA-24 and Division 2 Specifications. Bearing surface of thrust blocks shall be sized to match soil conditions encountered and all thrust blocks shall bear against undisturbed soil. The connection between the underground piping and the base of the riser shall be securely anchored with rods and clamps. All underground pipe and fittings shall be poly-wrapped and taped against soil conditions as conditions warrant. Excavation and backfill shall be as required by Division 2 Specifications.

- 2.6 Drains and Test Connections: Provide valved drain lines throughout the system to permit complete system drainage. All of the above to be shown on the drawings and/or as required by codes and authorities. Discharge location of all drain and test lines required but not indicated on the contract drawings shall be subject to specific approval of the Architect.
- 2.7 Pipe Hangers: Hanger installation methods to be per NFPA-13 and as called for herein. Provide intermediate supports and pipe support stands where necessary and as called for herein. Suspend from concrete or precast ceilings with drop-in anchors.
- 2.8 Electric Switches: Provide supervisory tamper switches for all valves controlling water supplies to the system including outside P.I.V. Provide waterflow switches as indicated on the drawings. Coordinate with electrical Contractor to insure that switch contacts and voltages are compatible with fire alarm system.
- 2.9 Sleeves and Openings: Pipe passing through plaster, masonry, fire rated, or concrete walls, floors, or partitions shall be provided with sleeves.
- Seal all openings in rated walls, and ceilings with a U.L. listed through-penetration firestop sealant. Depth of sealant shall be sufficient to provide a fire rating equal to that of the penetrated structure. See General Mechanical Provisions for additional requirements.
- 2.10 Escutcheons: Provide pipe escutcheons where exposed piping passes through walls, floors, or ceilings. Inside diameter shall fit around pipe, outside diameter shall cover sleeve.
- 2.11 Identification Signs: Provide at all control, drain and test valves, and at other locations as suggested by NFPA and the authorities having jurisdiction, signs of approved design identifying function and noting special cautions. Submit for Architect's review and approval a list of all signs, noting sizes, materials, nomenclature and colors.
- 2.12 Tests: All completed work shall remain uncovered if at all possible until required tests have been completed. However, in the event the project construction schedule requires it, the Contractor shall make arrangements for prior tests on the portions of the work involved. The Architect and all inspection authorities shall be notified of tests five days in advance and shall be represented at such tests if they so desire.

All portions of the system shall be hydrostatically tested at 200 psi for 2 hours. Tests shall be repeated until work is proved tight at these pressures. Repair all defects disclosed by tests and replace defective materials. Caulking of screw joints will not be permitted. Test pressure is to be maintained by a small capacity pump to minimize water damage in the event of a break. Tests are to conform to the requirements of NFPA 13 and Factory Mutual.

Operational tests of all signal initiating devices shall be conducted. Tests shall be performed by actual operation of the equipment to which the device is attached, and devices shall be adjusted and tests repeated until performance is satisfactory and acceptable.

Records of all tests are to be made available for Architect's inspection as required. Contractor is to provide all labor and materials required for the tests, and assume all costs, including those for repair of damage caused to other work or equipment. Tests are to be performed only at such times that the ambient temperature throughout the test period will be high enough to prevent freezing in any portion of the system and to assure complete drainage afterward.

- 2.13 Inspections: Upon completion of work, or at any time theretofore, inspection shall be made by the Architect or his representative and any corrections, changes, or removal of defective work required by them shall be made by the Contractor. Final acceptance will not be made until all such required changes are accomplished.
- 2.14 Acceptance: The operation of the equipment and the fire protection installation by the Owner does not constitute an acceptance of the work. The final acceptance is to be made only after the Contractor has adjusted his equipment, demonstrated that it fulfills the requirements of the specifications, drawings, and all applicable authorities, and has furnished all the required certifications.
- 2.15 Service and Maintenance Instructions: Service and maintenance instructions and demonstrations covering the necessary and recommended testing, operating and maintenance procedures for each type of system to the building maintenance personnel as directed by the Architect. Provide 3 sets of bound manuals containing for each piece of equipment the following materials:
- A. Manufacturer's descriptive literature
  - B. Operating and maintenance instructions
  - C. Parts list
  - D. As-installed control diagrams, including color-coded wiring diagrams for all electrical motor controlled connections and interlock connections with other mechanical equipment.
- 2.16 Clean-Up: All refuse and debris accumulated from the system installation shall be removed by the Contractor on a regular basis.
- 2.17 Guarantee: The Contractor shall guarantee the system and all components for a period of one year from the date of final acceptance against defects due to faulty materials or workmanship. Such defects arising shall be immediately corrected at no cost to the Owner. Consult general requirements for detailed form and requirements.
- 2.18 Protection From Freezing: Pipes, sprinklers or risers in unheated spaces in the building shall be protected from freezing in accordance with the applicable methods outlines in NFPA-13.
- 2.19 Protection During Construction: Provide as required by NFPA and local authorities.
- 2.20 Painting: Clean and paint all piping in mechanical rooms, attic, stairwells, at main riser, and other areas where exposed to view. See General Mechanical provisions for additional requirements.
- 2.21 Cleaning: All equipment, pipe, valves, fittings, and hangers shall be cleaned of grease, oil, metal cuttings, sludge, and construction debris.

- 2.22 Piping Identification: Identify all piping with Seton Snap-Around pipe line markers, or approved equal. Markers to be color-coded in accordance with ANSI standard A-13.1, bear name of pipe contents, and show direction of flow. Install markers at each valve, on each side where piping passes through walls and floors, and every 40 feet along continuous runs.
- 2.23 Spare Head Cabinet: Provide at a location as directed by the Architect a spare sprinkler cabinet. Cabinet shall contain no less than two of each type, finish, and temperature rating of sprinkler used on the project, along with a wrench as required for each style. Total number of spare sprinklers provided shall not be less than the minimum set forth in NFPA-13.

### PART THREE – MATERIALS AND PRODUCTS

- 3.1 General: All materials and equipment shall be the standard catalogued products of manufacturers regularly engaged in the manufacture of such products. Similar types and items of equipment shall be produced by the same manufacturer. Unless otherwise noted, all materials and equipment shall be listed in the January 1998 Underwriter's Labs, Inc. Fire Protection Equipment Directory, and shall be the latest design of the manufacturer.
- 3.2 Piping: Above ground piping shall be steel, ASTM-A795, A-53, or ASTM A-135, black or galvanized as required, in accordance with NAPA standards. Pipe 2-1/2" and larger may be schedule 40 or schedule 10 (6"=.134 wall, 8"=.188 wall), pipe 2" and smaller shall be schedule 40.
- 3.3 Fittings: Fittings for above ground piping shall be screwed, flanged, shop-welded, mechanical grooved or any combination thereof.

Screwed fittings shall be cast iron, 125 lb. class, black or galvanized as required, in accordance with ANSI B16.4 or malleable iron, 150 lb. class, black or galvanized as required, in accordance with ANSI B16.3.

Flanged fittings shall be cast iron, short body, 125 lb. class, black or galvanized as required, in accordance with ANSI B16-1. Gaskets shall have a full face of 1/8" minimum thickness red sheet rubber. Flange bolts shall be hex head machine bolts with heavy semi-finished cadmium plated hex head nuts, having dimensions in accordance with ANSI B18.2.

Shop-welded fittings shall be steel, standard weight, black, in accordance with ANSI B16.9, ANSI B16.25, ASTM A-234, ANSI B16.5 or ANSI B16.11.

Mechanical grooved couplings or hole-cut branch connections shall be cast or malleable iron, 175 psi minimum working pressure with matching gasket.

Underground fittings shall be cast-iron, Class 150, mechanical joint, in accordance with AWWA C-110 and C-111.

- 3.4 Valves: Gate valves 2" and smaller shall be bronze body, 175 psi working pressure, screwed ends, wedge disc, 09&Y pattern, Nibco T-104-0 or approve equal.

Butterfly control valves shall be ductile iron body, gear operated, with monitor switch adapter.

Ball drip valves shall be brass with stainless steel spring, Viking Model B-1 or approved equal.

Check valves 2-1/2" and larger shall be iron body, bronze mounted, 175 psi working pressure, Flanged or grooved ends, rubber-faced disc.

Drain and test valves shall be bronze, globe or angle type, 300 psi, renewable rubber disc., United Brass Works figure 455 or 465 or approved equal.

- 3.5 Electric Switches: Tamper switches shall be OS&Y type, P.I.V. type, or butterfly type as required, containing at least one SPDT circuit switch set to operate within two revolutions of the valve control wheel or when the stem has moved no more than one-fifty of the distance from its normal position. Switch shall have a minimum rated capacity of 1 amp 125 volt, A.C. - .25 amp 24 volt D.C. The unit shall be arranged to cause a switch operation if the housing cover is removed or if the unit is removed from its mounting. Mounting shall not interfere with the normal operation of the valve.

Waterflow switch shall be vane-type with an instantly recycling retard adjustable from 0 to 60 seconds. Unit shall contain two SPDT circuit switches which transfer upon a minimum waterflow rate of 10 GPM. Switches shall have a minimum rated capacity of 7 amp, 125 volt A.C. - .25 amp, 24 volt D.C. Notifier series WFD, or approved equal. Unit shall be compatible with piping as regards to piping wall thickness.

- 3.6 Hangers: Hanger rings shall be zinc plated, adjustable swivel ringband-type, Gem F730 or approved equal.

Beam clamps shall be malleable iron with cup-pointed set screw and jam nut, GEM F740 series or approved equal.

Drop-in anchors shall be zinc-plated steel, threaded to match rod size, Hilti HDI-3/8 or HDI-1/2 or approved equal.

- 3.7 Sleeves and Openings Sealants: As specified in General Mechanical provisions.

- 3.8 Escutcheons: Pipe escutcheons shall be one-piece chrome plated heavy brass or steel, minimum 18 gauge, with retaining setscrew.

- 3.9 Fire Department Connection: Fire department connection shall be polished brass, 2-way, 2-1/2 x 2-1/2 x 4", free standing or wall type, cast brass body, individual drop clappers, with matching polished brass pin-lug plugs and chains, and polished brass sleeve. Potter-Roemer model 5761-B, lettered "AUTO.SPKR."

- 3.10 Sprinklers: Sprinkler heads shall be of the approved automatic spray-type, upright, pendent, or horizontal sidewall, as application requires. Orifice size shall be as required by hydraulic calculations, temperature rating shall be as required by thermal conditions at the individual head location. Unless otherwise noted, types shall conform with the following requirements.

- A. Sprinklers on ceilings other than closets, storage, attics: Viking model Horizon Mirage, concealed type, with factory-painted special color cover plate. Consult Architect for required color. Allow for one color in base bid.
- B. Sprinklers on ceilings at closets, storage, attics: Viking model M., chrome, recessed type, with matching chrome escutcheon.
- C. Upright sprinklers: Viking model M. brass.
- D. Note: All sprinklers to be quick-response type.
- E. Other type sprinklers as required for industrial application.

#### PART FOUR – DESIGN CRITERIA

4.1 General: Entire building shall be protected by a sprinkler system. Underground portions of the system shall be sized and run generally as shown on the drawings. Sprinklers shall be provide for all areas.

4.2 Hydraulic Calculations: Detailed hydraulic calculations shall be required. Calculations shall include allowances for valves, fittings, changes in directions or piping, elevation changes, and all other items as set forth in NFPA-13. The form of the calculations shall be in accordance with NFPA-13 and requirements of Factory Mutual and shall contain all information requested therein.

Sprinkler systems shall be hydraulically designed to meet the densities/remote areas of application as shown on the drawings and as called for herein. Calculations shall include a 5psi safety margin below the supply curve.

4.3 Water Supply: Hydraulic design shall be based on the available water supply at the point of connection to the City main. Contractor shall verify by means of a flow test at site prior to final design.

END OF SECTION





## SECTION 15010

### GENERAL MECHANICAL PROVISIONS

#### PART 1. GENERAL

- 1.1. General Requirements: Division One is applicable in full hereto. For the purpose of this specification the word "provide" shall mean, "furnish and install, complete and ready for use". **No building materials or products which contain asbestos, formaldehyde, lead or mercury, as defined by OSHA and EPA, shall be utilized.**
- 1.2. Codes: Comply with applicable NFPA, ASME, OSHA, IBC, ASHRAE, SMACNA and ANSI requirements, with local Building Codes, Mechanical Codes, Gas Codes, Plumbing Codes, ASHRAE Standard 90.1 2004, 2006 International Energy Conservation Code and with other local ordinances and codes. All pressure vessels shall be constructed and tested in accordance with applicable ASME Codes and shall bear ASME stamps unless specified otherwise. Where conflicts occur between a code and contract drawings or specifications, the most stringent requirements shall apply.
- 1.3. Permits: Provide all permits, pay all fees and arrange for inspections as required by local and state authorities. Furnish certificate of final inspection and approval from local building inspectors. Provide additional materials, parts, etc. and modify the work as required by Government Inspections and Regulations. The plumbing and mechanical contractor, as applicable, shall arrange and pay for the State of Alabama Boiler and Pressure Vessel Safety Division inspector to visit job site to inspect water heater and boiler installation as applicable and obtain written approval certification. Correct all deficiencies required by Code officials at no additional cost to the owner.
- 1.4. Drawings: In the interest of clearness, the work is not always shown to scale or exact location. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural and electrical drawings, and lay out work so as to fit in with ceiling grids, lighting and other parts. Make minor adjustments in the field as required to provide the optimum result to facilitate ease of service, efficient operation and best appearance. Where doubt arises as to the meaning of the plans and specifications, obtain the Architect's decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question. **DO NOT SCALE** Plumbing and HVAC drawings. The various scales used on the drawings do not allow for all fittings, offsets and accessories that may be required to complete the work. The contractor shall carefully investigate the conditions that would affect the work to be performed and shall arrange such work as necessary to comply with the intent of the construction documents. Refer to Architectural drawings for dimensions and verify scale shown on the drawings. All drawings are diagrammatic and are intended to quantify the materials specified and indicate their intended relationship to each other.
- 1.5. Conflicts, Coordinations and Changes: In the event that interferences or conflicts occur, the Architect shall decide which equipment shall be relocated regardless of which was first installed. In the interest of avoiding such conflicts, each sub-contractor who is using common space, etc., shall coordinate his work with all other trades and other parts of his own work. If, during this coordination, it is discovered that necessary or desirable changes should be made, advise the Architect and secure his decision in writing. The drawings and specifications are complementary and work shown, but not

specified, or specified, but not shown, shall be the same as though required by both.

Do not fabricate any duct nor install any pipe until all coordination has been accomplished.

- 1.6. Warranty: Guarantee in writing to make good without cost any defects in materials and workmanship for one year following the date of acceptance of the project. Provide free maintenance and service during the guarantee period to **include furnishing and replacing of filters. Filter changes shall be done quarterly.** See other Sections for special guarantee of air conditioning compressors, water heaters, heat exchangers, etc. All air conditioning units' compressors shall have extended, 4-year, non-prorated replacement warranties.

- 1.7. Submittal Data: Within 25 days after award of the contract, submit for approval a complete schedule of material and equipment proposed. When incomplete schedules of materials and equipment are submitted, the contractor is responsible for providing all items specified. If and when it is determined that items installed were not as specified, the Contractor shall be held responsible to replace such items any time discrepancies are found.. Include catalog data, scheduled capacities, fan curves, etc. Where substitutions are proposed, unless the Contractor states in writing the differences of the substituted equipment or material, he shall be held responsible to replace such items any time discrepancies are found. All submittals shall be bound into a notebook, separately (plumbing from HVAC), indexed and tabbed. A cover sheet shall be provided which states, as a minimum, the project name and location, the name of the owner, the architectural firm, the engineering firm, the general contractor, the mechanical contractor (plumbing contractor for plumbing submittals), the contractor's point of contact with phone number. A summary sheet shall be inserted at the beginning of each tabbed section summarizing the contents of each section. Include materials used, methods of installation, product manufacturer, equipment capacities, etc. HVAC equipment items shall follow the identical format shown on the equipment schedules. Plumbing submittal items shall be provided in the same manner. **Failure to provide the submittals in the format specified will be cause for rejection without review.** Also, follow procedures set forth in Division One. **The General Contractor shall review and approve all submittals prior to submitting same to the Architect. Submittals without the General Contractor's approval will be rejected without review.**

Before starting work, submit for approval, shop drawings showing proposed arrangement of equipment, duct work, detailed plan sections and isometric of mechanical room piping, floor drains, power requirements, and controls. As a minimum, submit detail layouts of potential conflicts at plumbing risers, equipment rooms, limited ceiling space, etc. Refer to subsequent Sections for additional specific requirements. Failure to submit shop drawings will make the Contractor responsible for changes required to facilitate installation of all systems.

- 1.8. Existing Conditions: Bidders shall visit the site and become acquainted with all job conditions. Report to the Architect, prior to bid, any conditions that are required to accomplish the installation of all systems. Provide for required adjustments to complete the intent of the work. No consideration will be given after bid opening for alleged misunderstanding regarding job conditions, utility connections, permits, fees, etc.
- 1.9. Line Locators: Before proceeding with excavating or trenching, arrange with various utility companies, owners or line locating firm(s) to describe and mark any and all of

their systems which might be damaged by construction operations.

- 1.10. Phasing: Interrupt existing services only at times approved by the Owner. Hold interruptions to the minimum in duration and frequency.
- 1.11. Record Drawings: Provide in such detail, as is set forth under General and Supplemental Conditions.

Additionally, keep an accurate record of changes made during construction.

Transfer these changes to a set of reproducible copies of original drawings that Architect will sell to Contractor at printing cost. Sheet metal drawings may be a set of mylar reproducible copies of the final corrected sheet metal shop drawings. When work is completed submit corrected reproducible drawings to Architect for record. Also, provide to the architect, as-built drawing files on CD-R type CD. Drawing files shall be provided (as a minimum) in ACAD (AutoCAD) 2006 format. Verify ACAD Release version required by the owner, with the owner, and provide as required. DXF files are **not** acceptable. The contractor may obtain CAD files from the engineer for a fee of \$150 per sheet. The contractor will also be required to sign a letter of agreement pertaining to the use of the electronic files and the contractor's responsibilities for the use of those electronic files, prior to the Engineer sending the electronic files. The drawings are provided to the contractor "as is". The contractor is responsible for providing and showing all changes to the drawings that are different from the original contract drawings, including but not limited to addendums, change-orders, etc.

## PART 2. WORK RELATED TO OTHER TRADES

- 2.1. Foundations: Applicable mechanical contractor shall provide foundations, supports, etc. not specified under other Divisions and as required to mount equipment in a safe, sound, workmanlike and structurally sound manner. Consult drawings pertaining to other trades to determine extent of their work. Applicable mechanical contractor shall provide all sub-framing extending from typical structural members to supported items. Concrete pads for outside equipment are specified under other Sections. Concrete work shall meet requirements of Division 3.
- 2.2. Roof Flashing: Built-up base flashing, and other related roofing work is specified under Roofing Section but with reservation that roofer be advised of requirements and furnished items to be installed before roofing is in place. Flashing cones, counter flashing hoods, storm collars, flashing for vent stacks are to be provided by applicable mechanical or plumbing contractor. All items furnished shall adhere to roofing manufacturer's requirements so as not to void the roofing warranty.
- 2.3. Electrical Work and Coordination between Mechanical / Plumbing Trades: Refer to subsequent Sections.
- 2.4. Pipe Sleeves: Fit all pipes passing through walls, partitions and floors (except slabs on grade construction) with sleeves. Sleeves shall be built-in as work progresses. Sleeves in new construction shall be set before concrete is poured or masonry is erected. Sleeves in existing construction shall be firmly grouted in place. Sleeves through concrete joists and beams shall be of Schedule 40 galvanized steel pipe. For piping penetrating exterior walls underground provide mechanical "Link Seal". Sleeves for pipe passing through interior walls or partitions shall be 20 gage galvanized steel,

1/2" larger in diameter than pipe or piping covering. Sleeves for pipe passing through exterior walls or partitions that contain refrigerant piping shall be Schedule 40 PVC pipe, 1/2" larger in diameter than pipe or piping covering.

Sleeves in new construction shall be set before concrete is poured or masonry is erected.

Sleeves for ducts: See fire dampers.

Sleeves shall extend 1-1/2" above finish floor.

Where copper pipe passes through a slab on grade, provide a 24" long plastic pipe sleeve. Install all under-slab on-grade copper piping in plastic jacket equal to "Plastic Sleeve" as manufactured by Plastic products Company of Stanton, California.

- 2.5. Access Panels and Doors: Furnish to general contractor for installation wherever required for access to valve, damper, air vent, cleanout, smoke detector or similar device. Doors shall be suitable for wall or ceiling finish involved, 16" x 16" unless otherwise indicated or as required to permit removal of equipment and/or provide acceptable maintenance access, fire rated where rated assemblies are penetrated. Identify all access panels and doors to indicate item for which access is provided for. Ex. Motorized damper, fire damper, etc.. Additionally, add the following to each access panel identifier: "DO NOT BLOCK". See specification section "Identification" for materials and methods required. Access panels and doors shall be as manufactured by Milcor, Philip Carey, Zurn or other approved equal. The Architect must approve proposed type before installing.

Where device occurs above a lift-out acoustical ceiling panel, provide engraved plastic labels of type specified in "Miscellaneous Requirements, Identification", below. Engraved plastic labels shall match ceiling grid color and be neatly glued to the ceiling grid adjacent to the ceiling tile that should be removed for access to the item. The label shall have engraved on it the item being identified and its identifier as shown on the plans, valve chart, etc.

- 2.6. Cutting and Patching: Openings are to be laid out and built-in. Furnish detailed layout drawings to other trades in advance of their work. Failure to furnish layout shop drawings to General Contractor shall make the applicable mechanical / plumbing contractor responsible to rebuild openings as directed by the Architect. Piping within or behind walls must be installed before wall is erected. Otherwise walls, etc. affected must be reworked by trade which erected same at expense of Mechanical / Plumbing Contractor. Chasing and cutting of new work will not be accepted.

The millwork contractor, upon receipt of proper templates, shall make cutouts in countertops. Openings in existing walls shall be made by trade requiring same, with repairing and patching required thereby done by the respective trade whose work is damaged.

- 2.7. Painting and Finishing: Clean and paint with two coats of black latex paint all exposed ferrous metal parts of hangers, unistrut and other assemblies used for supporting of ducts (except duct straps), piping and plumbing related items in mechanical rooms, of painting, the contractor may substitute factory painted or coated items. All paints and coatings shall comply with 25/50 smoke and flame spread requirements when located in a return air plenum. Also, see specification section, "Identification".

Painting of ducts, piping and other surfaces in finished areas is specified under Section "Painting". Where factory finished items are marred or scratched, replace the item, or upon approval from the architect or owner, refinish or touch-up as required to bring to a like-new condition.

### PART 3. EXCAVATION, TRENCHING & BACKFILLING

- 3.1. Excavating: Insure that walls and footings and adjacent loadbearing soils are not disturbed in any way, except where lines must cross under a footing. Where a line must pass under a footing, make crossing with the smallest possible trench to accommodate the pipe. Where a line must pass adjacent to and below the bottom of a column footing, or the corner of a continuous footing, backfill the trench with concrete up to the level of the footing bottom, for a distance away from the footing equal to the depth of the fill.

Keep excavation free from water by pumping if necessary. Dig trenches true to line and with a flat, even bottom. Form bell-holes to allow proper bedding of the pipe sections. Top of all piping must be at least 24 inches below finish grade. Remove and relocate existing obstructions as directed.

- 3.2. Pipe Trenches: Make true to grade using string and batter-boards. Place pipe on undisturbed earth where possible; otherwise provide concrete pads or mortar laid masonry piers at all joints and no further than 8' on centers.
- 3.3. Shoring, Sub-Soil Assumptions and Data, Work Around Trees, Surplus Earth: Refer to Section "Earthwork".
- 3.4. Backfilling: Immediately after testing and/or inspection, carefully backfill trenches with earth free from clods, brick, etc., to a depth one-half the pipe diameter. Then firmly puddle and tamp as not to disturb the alignment or joints of the pipe. Thereafter, puddle and tamp every vertical foot. Do not place clods, brick, stones, etc., in the trench until the pipe has one-foot cover, and not in trenches under the building slab in any case.

Backfill within the building and under paved areas shall meet compaction requirements established under Division 2. Fill material shall be pit run gravel or similar granular material.

- 3.5. Broken Pavement: In public streets, backfill and repair to satisfaction of authorities having jurisdiction.

### PART 4. PIPE HANGERS AND SUPPORTS

- 4.1. General: Provide factory fabricated pipe hangers and supports for all piping of type and size specified, bolts, washers, etc. as required for a complete functional installation. Material items, methods and general requirements not covered in this specification shall be provided in strict accordance with Manufacturer's Standardization Society Specification MSS SP-58, MSS SP-69 and Manufacturer's Published Product Information.
- 4.2. Painting: Clean and paint with two coats of black latex paint all exposed ferrous metal parts of hangers, unistrut and other assemblies used for supporting of ducts, piping and

plumbing related items in mechanical rooms. Include black steel pipe, uncoated cast iron pipe, hangers, brackets, etc.. In lieu of painting, the contractor may substitute factory painted or coated items. All paints and coatings shall comply with 25/50 smoke and flame spread requirements when located in a return air plenum.

- 4.3. Spacing: Install supports as required to prevent sags, bends or vibration. In any case, provide within 6 inches of elbows, take-off fittings, valves, any change in direction of item supported and at ends of branches over 5 feet long and on centers not exceeding the following:

copper tubing	up to 1", 6 feet; over 1", 8 feet
steel pipe	up to 1 ¼", 6 feet; over 1 ½" and 2", 8 feet 2" through 3 ½", 10 feet; over 3 ½", 12 feet

Provide additional building attachments where support is required for additional concentrated loads, including valves, in-line pumps, flange guides, strainers, expansion joints and at all changes in direction of piping.

Support cast iron pipe adjacent to each fitting and on centers not exceeding five feet.

At no-hub pipe, support as above, and in addition provide adequate sway bracing to stabilize all components of the system. Provide special support for fixture arms, closet bends, etc.

- 4.4. At Typical Suspended Horizontal Pipe: Adjustable clevis or split-ring type equal to Elsen Fig. 12 or 10c.
- 4.5. Vertical Piping along Wall: Elsen Fig. 39 and 37 riser clamps at floors and Fig. 44 standoff brackets toggle bolted to wall. Place under hubs or couplings where at all possible. For piping up to 6" use two-bolt riser clamps. For piping over 6" use four-bolt riser clamps.
- 4.6. On Insulated Lines: Size hanger loops to fit **over** insulation and provide 12" long, 22 ga. galvanized sheet metal, half round saddles, to protect all piping up to 1 ¼". Provide for piping over 1 ¼" a preformed, preinsulated saddle assembly consisting of an **integral metal saddle and insulation**. The assembly shall be a 360 degree section of 3.0 pcf density polyisocyanurate pipe insulation. The assembly shall have a 6-mil thickness, .01 perm rated industrial grade vapor retarder film. The insulation shield shall be a G-90 galvanized steel, 360 degree self-clamping and be **integral with the insulation**. The assembly shall also be provided with an insulation lock joint longitudinal seam. The assembly shall meet the requirements of ASTM D1622 for insulation density, ASTM C518 for thermal conductivity, ASTM D1621 for 50 PSI compressive resistance, and ASTM D374. The insulation jacket shall have a hazard rating not to exceed 25 flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E-84, NFPA 255 and UL 723. The assembly shall be equal to Buckaroos, Inc, Model 3300E of Indianapolis, IN.
- 4.7. Manifolds and Parallel Runs: At his option, Contractor may provide a Unistrut system complete with standard fittings, clamps and accessories required. Furnish for approval proposed system components.
- 4.8. Where in Contact with Copper Pipe: Same as above except hangers shall be copper plated.

- 4.9. Hanger Rods: Shall be mild steel, threaded as required. Use not smaller than 3/8" rods for pipe 2" and under, 1/2" rods for pipes 2 1/2" through 4", 3/4" rods for 5" through 12" and 1" rods for piping over 12", but generally as standard for the hanger selected. Support rods with threaded Underwriters' listed inserts, expansion shields or beam clamps, shall be all galvanized. Beam clamps shall be equal to Elsen Fig. 34 or 36 with rod and eye end.

At bar joists support from bottom chord at panel points. For piping over 6" provide supplemental steel angle supports and welding to span 3 joists when running parallel to joists and welded angle between two panel points for piping running perpendicular to joists. Concrete inserts shall be equal to Grinnell Figure 282.

- 4.10. Spring Type Pipe Hangers: Provide as required to isolate pipe vibration from the building.
- 4.11. Supports for Water Supply Piping in Spaces Behind Plumbing Fixtures: ABS brackets and U-bolts. Secure the 2-piece brackets to cast iron stacks. U-bolts shall be sized to bear on the pipe. Brackets shall be P&M Bracket Co. or equal.
- 4.12. Lateral Movement Supports: Support piping as required to control lateral movement without affecting expansion and construction movement. Install cushion clamp assemblies of type as manufactured by Hydra-Zorb Company.
- 4.13. Bracing: Where hanger rods height exceed 16" provide diagonal bracing at every fourth hanger and attach to the building structural system.
- 4.14. Approved Equivalents: By Grinnell, Elsen, Stockham or Crane will be accepted.

## PART 5. MISCELLANEOUS REQUIREMENTS

- 5.1. Materials and Equipment: New and of best quality in every respect. Pipe and fittings shall conform to the ASTM Standard designated for pipe of each material. Equipment shall be UL approved where commercially available. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer, however, the component parts of each unit need not be. All pressure vessels shall be constructed and tested in accordance with applicable ASME Codes and shall bear ASME stamps unless stated otherwise. Minimum pressure rating shall satisfy job conditions. Submit to the Architect certificates of inspection and approval. All equipment that is not covered by the U.S. National Appliance Energy Conservation Act (NAECA) of 1987 shall carry a label installed by the manufacturer stating that the equipment complies with the requirements of ASHRAE/IESNA Standard 90.1. All HVAC equipment shown in ASHRAE/IESNA Standard 90.1-2004, Tables 6.8.1A through 6.8.1G shall have minimum performance at the specified rating conditions when tested in accordance with the specified test procedure. Where multiple rating conditions or performance requirements are provided, the equipment shall satisfy all stated requirements, unless otherwise exempted in the aforementioned tables. **No building materials or products which contain asbestos, formaldehyde, lead or mercury as defined by OSHA and/or EPA shall be utilized.**
- 5.2. Workmanship: First class, premium and in accordance with best practice. Pipe shall be cut clean, properly reamed, threaded or soldered, erected plumb and secure. Make

changes in pipe size with reducing fittings without the use of bushings. Work shall be executed by experienced mechanics and shall present a neat appearance. Install equipment in accordance with manufacturer's recommendations.

At all stages of installation, protect pipe openings, fixtures, ductwork, and equipment against the entrance of foreign materials, and from damage by the elements, mortar, paint, etc. **ALL** open portions of ductwork and equipment shall be covered with a self-adhesive film to prevent the intrusion of contaminants. The material shall be a minimum of 3 mil thick and have a minimum tensile strength of 10 psi. It shall be blue in color, UV resistant and waterproof and recyclable. Open ends of ductwork shall be protected prior to delivery to the project site. Any taps, take-offs, etc., shall be protected immediately after the tap, take-off, etc. has been made in the field. **This requirement will be strictly enforced. Any ductwork discovered to be unprotected as specified is subject to rejection for use on this project.** Absolute coordination is required with the other contractors on the project before proceeding with installation of any system or item.

- 5.3. Factory Finishes: Manufacturer's standard unless otherwise stated. Submit color cards for selection where choice exists.
- 5.4. Expansion: Provide for expansion and contraction of all piping and make proper provisions so that excessive strain will not occur on piping or other parts.
- 5.5. Safety Provisions: Provide covers or guards on all hot, moving and projecting items that could be a hazard to occupants of the building or to service personnel.
- 5.6. Cleaning and Adjusting: Upon completion of work, clear all drains, traps, fixtures, ducts and pipe. Adjust all valves, pack stuffing boxes, remove rubbish and leave work in clean and excellent operating condition. Install final permanent type filters only after cleaning of building is completed.
- 5.7. Escutcheons: Where pipes pass through floors, walls and ceilings of finished rooms, provide pressed chrome-plated brass or steel plates securely fastened in place. Caulk pipe opening behind escutcheons to prevent passage of smoke and make vermin proof.
- 5.8. Identification: Identify all piping and jacket of insulated pipe exposed to view and/or accessible through removable ceilings or access panels, with Seton "Snap-Around" pipe line markers, Marking Services Inc (MSI) Series MS-970 or approved equivalent. The markers shall be color-coded in accordance with ANSI Standard A13.1. Identification shall bear name of pipe contents and show direction of flow. **"Stick-on" type markers are unacceptable.** Install markers at each valve, fitting, change in direction, branch take-off and along runs of pipe as required for proper identification but not further apart than 10 feet. Provide piping identification in small (closets, storage rooms, etc.) areas above ceilings where partition walls go to the structure above. Plumbing system piping identification shall comply with IBC requirements.

All equipment, smoke detectors, smoke dampers, access panels, motor starters, disconnects, thermostats, humidistats, other control systems components, control switches, and related devices shall be equipped with engraved laminated plastic nameplates, as described below, but not less than 1/4" high.

Labels shall be a minimum of 2" x 3" x 1/16" thick, laminated plastic labels (larger if



needed) with 1/2" high x 1/8" stroke numerals and letters to identify all equipment furnished under this Section. Red with white lettering or white with red lettering as required for maximum contrast with color of the equipment. **Screw** tag(s) to equipment in easy to read locations unless screwing tags to equipment voids warranty. If screwing identification to equipment voids warranty, neatly attach identification with permanent adhesive. Engrave equipment designation and numbers as shown on plan and drawings on upper half of tag, leaving lower half of tag for tag for future engraving by Owner. Where equipment is typed (HP-A, HP-B, EF-A, etc.) rather than numbered (HP-1, HP-2, EF-1, etc.) the tag shall include the room number(s) of the area served. Room numbers indicated on the architectural plans shall be used as the reference. Additionally, permanently affixed warning labels shall be attached to all equipment, on a highly visible location on the equipment, that can be automatically started. The warning label shall read as follows: "CAUTION !! This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect switch to "OFF" position before servicing or attempting to work on equipment." Permanently affixed warning labels shall be attached to all motor starters and all control panels which are connected to multiple power sources utilizing separate disconnect switches. The warning labels shall read as follows: " This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing or working on this item."

Fit all valves (except equipment service valves and sprinkler valves) with engraved laminated plastic valve tags firmly secured with brass jack-chain and s-hooks to valve yoke or stem (not handles) or adjacent pipe. Fabricate tags as 2" x 3" x 1/16" white plastic with beveled corners, engraved both sides with 1/2" high x 1/8" stroke red letters and numerals. Locate numbers at one edge of tag leaving room for future engraving by others. Number tags in sequence, starting with number 1; prefix the number with the trade (P). Also, for each valve identified above the ceiling, provide an engraved laminated label, of the type specified above, and glue to the ceiling tile grid below the valve. In each equipment room provide a valve chart framed under glass or plastic which shows the number and location of each valve and type of service.

Where the tag, label or marker occurs in a plenum (return air) space, the plastic employed shall carry a Class A Flame Spread Rating per ASTM E-84, and shall meet ASTM D-635 (such as Westinghouse Micarta engraving stock).

Identify location of equipment, valves, etc. above ceilings is specified under Par. 15010-2.6.

Access openings to fire dampers and smoke dampers shall be permanently identified on the exterior of the access panel by a label having letters not less than 3/4" in height and reading: " SMOKE DAMPER – DO NOT OBSTRUCT ACCESS " or " FIRE DAMPER – DO NOT OBSTRUCT ACCESS ".

- 5.9. Firestopping: Wherever pipes, ducts, etc. penetrate fire rated construction (walls, partitions, floors), the space between the penetrating member and the building construction shall be sealed with a firestop that provides an effective barrier against the spread of fire, smoke and gas. Carefully coordinate work with types of construction encountered and with Par. 2.4, Pipe Sleeves, above.
- 5.10. Soundproofing: Wherever ducts, pipes, etc. penetrate walls, floors and ceilings and other partitions, close openings as specified for firestopping. i.e., all penetrations shall be sealed.

- 5.11. Delivery and Storage: All equipment and materials delivered and placed in storage shall be protected from the weather, humidity and temperature variations, dirt and dust, and other contaminants.
- 5.12. Dielectric Isolation: Provide dielectric isolation where dissimilar metals are joined, at supports, etc. For pipe sizes 2" through 6", copper piping flanges shall be drilled to ANSI B 16.5 150/125 Standard and powder coated, with an EPDM insulator adhered to the plate steel flange protruding inside of the steel flange to prevent contact with the copper flange adapter. The copper component of the flange adapter shall be Third Party Classified by Underwriters Laboratories, Inc. Minimum working pressure shall be 300 psi at 272°F.

Where auxiliary drain pans, sheet metal stands and other metal appurtenances are specified or required to be installed under equipment, and the pan is to be installed on a concrete or dissimilar metallic floor, the contractor shall provide complete dielectric separation between the entire item and the concrete or dissimilar metal.

END OF SECTION

## SECTION 15400

### PLUMBING

#### PART 1. GENERAL & MISCELLANEOUS

- 1.1. General Provisions: Section 15010 is applicable in full hereto. **No building materials or products which contain asbestos, formaldehyde, lead or mercury, as defined by OSHA and EPA, shall be utilized.**
- 1.2. Scope: Include all equipment, material and labor required for a complete operating plumbing, system and gas distribution, even though every item involved is not indicated. Refer to architectural drawings and verify all plumbing fixtures. Notify the architect prior to bid of any discrepancies.
- 1.3. Qualifications: Subcontractor shall be an established licensed plumber with satisfactory experience in at least 3 equivalent projects.
- 1.4. Electrical Work: All electric power wiring required for installation of equipment under this Section is specified under Electrical Division. Plumbing Contractor shall furnish and install all controls and control wiring as specified or required to properly complete the installation. Control conduit is specified under Electrical Division or shown on electrical drawings; all other control conduit shall be provided under this Section of the work. All electrical work performed under this Section shall meet requirements set forth in the Electrical Division.

#### PART 2. TESTS

- 2.1. General: Perform all tests in the presence of the Architect. Refer to Division One for Fuel, water and power required therefore. In absence of specific testing procedure comply with code requirements and/or nationally acceptable industry standards. Furnish written reports of all tests results specified to Architect.
- 2.2. Drainage and Vent System: Plug all openings, fill entire system with water to point of overflow and hold for at least one hour before inspection. System must remain full during the test without leakage. Each vertical stack with its branches may be tested separately, but any portion tested must have minimum ten-foot head.
- 2.3. Water Supply System: Test and secure acceptance of entire system before the piping or hot water storage heaters are insulated or otherwise concealed. Test as follows: disconnect and cap all outlets to plumbing fixtures and all other equipment not designed for the full test pressure. Fill the system with water; apply 150 psi hydrostatic pressure and hold for a minimum of two hours without pressure loss. All piping throughout shall be tight under test. Water piping shall remain under normal water pressure during construction except when freezing weather is expected.
- 2.4. Gas System: Apply 75 psi air test for a twenty-four (24) hour period without pressure loss through leakage. Test before tanks, equipment, appliances, etc. are connected.
- 2.5. Fixtures: Test for soundness, stability of support and satisfactory operation.

#### PART 3. SANITARY PIPING

- 3.1. Scope: Provide a system of soil, waste and vent piping connecting all plumbing fixtures, equipment, etc. to the house sewer, with consolidated vent connections extending through the building roof, all as shown on the drawings.
- 3.2. Utility Connection: Make connection to existing sewer main as indicated.
- 3.3. Soil, Waste and Vent Piping Inside the Building Walls and to Points Outside the Building as Indicated: Provide service weight hub-and spigot cast iron soil pipe and fittings for underground service and hubless for above ground service, meeting ASTM A-74 for hub and spigot and ASTM A-888 for hubless, coated inside and out. Pipe exposed within the building shall be uncoated outside and left clean for painting. Fittings to receive screwed pipe arms shall be recessed drainage type. Soil and waste pipe shall have long sweep connections. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

Joints for hub and spigot pipe shall be made with compression gaskets meeting ASTM C-564. Joints for hubless pipe and fittings shall be equal to MG couplings meeting ASTM A-48 and C-564, or Anaheim Foundry Husky Series "4000" heavy-duty couplings of Type 304 stainless steel.

Option: Contractor may use PVC schedule 40 DWV solid wall pipe and fittings meeting ASTM Standard D2665 and 1785 for above ground service and underground service. Use cast iron in areas used as return air plenums and fire rated assemblies. Paint all vents through roof with ceramic paint. All floor drains shall have deep seal p-trap. **"Cellcore" piping is not allowed.**

- 3.4. Laying Out Work: Vents from any fixture, when connected to a vent line serving other fixtures, shall be extended at least 6 inches above flood level rim of highest of such fixtures to prevent use of vent lines as a waste. Make changes in direction by appropriate use of 45 degree Y's, 1/2 Y's, or long sweep 1/4, 1/6, 1/8 or 1/16 bends. Sanitary T's or short 1/4 bends may be used on vertical stacks or drainage lines where change in direction of flow is from horizontal to vertical; except that long-turn TY's shall be used when two fixtures are installed back to back with common drain. Straight T's, Ells and Crosses may be used on vent lines. Make no change in direction of flow greater than 90 degrees. Where different sizes of drainage pipe or fittings are connected use standard increasers and reducers of proper size. Do not reduce size of drainage piping in direction of flow. Drilling and tapping of house drains, soil, waste or vent pipes, and use of saddle hubs and bands are prohibited. **All plumbing vents through the roof shall be located a minimum of 10'-0" away from all outside air intakes.** Coordinate all plumbing vents locations with the HVAC plans.

Do not begin work until elevation of final connection point is verified and grading of entire system can be determined (even if final connection is specified under another Section).

- 3.5. Hangers: Support cast iron pipe adjacent to each fitting and on centers not exceeding five feet with hangers as specified hereinafter. Rigidly support base of vertical runs with solid masonry or concrete.

At no-hub pipe, support as above, and in addition provide adequate sway bracing to stabilize all components of the system. Provide special support for fixture arms, closet bends, etc.

- 3.6. Grading: Uniform and not less than 1/8" PLF for pipe 4" and over, and not less than 1/4" PLF for 2" and 3" piping.
- 3.7. Roof Flashing: Roof penetrations are to be flashed by the roofing contractor, using materials as recommended by the roofing manufacturer and approved by the Architect. Coordinate work with Roofing Contractor. Offset vents as required to clear gravel guards and flashing courses. Extend vents 6" to 8" above roof level.

- 3.8. Waste Arms: Type K copper or IPS brass pipe typical; Schedule 40 PVC or IPS brass pipe at urinals.
- 3.9. Test Fittings: Not shown on the drawings; provide where required for partial tests.
- 3.10. Miscellaneous Joints: Where cast iron pipe joins clay or transite pipe, make joint by caulking with jute and filling (at one pouring) with hot compound meeting FS SS-C-608.

Use slip joints and unions only upstream from a trap seal.

- 3.11. Acid-Resisting Soil, Waste, and Vent Piping: Shall be equal to GSR "Fuseal" Flame Retardant polypropylene schedule 40 pipe and fittings. Make joints in strict accordance with manufacturer's recommendations. Use piping meeting ASTM E84 25/50 requirements for flame spread and smoke in all spaces used as plenum fusion joints below floor and mechanical joints above floor. Equal products as manufactured Pyrex glass, Duriron or CPVC will be accepted.

#### PART 4. DRAINAGE SPECIALTIES

- 4.1. Equivalent Products: Specialties by J.R. Smith, Josam, Zurn or Wade.
- 4.2. Cleanouts: Provide in sanitary piping at all changes in direction, at ends of branches, at intervals not exceeding 40 feet on straight runs, and elsewhere as shown. Cleanouts shall be full opening type, completely accessible. Size same as lines in which they occur, but not larger than 4 inch. Tees and extensions shall be of same weight as soil pipe. Plugs countersunk or raised head type with lead seals. Except as noted, catalog numbers are from J.R. Smith.

In Tile Floors: 4040, adjustable, cast iron body with cadmium plug and satin finished square scoriated Nikaloy top; where soft tile occurs provide 4160 recessed square Nikaloy cover.

In Concrete Floors: 4240, adjustable head, cast iron head and ferrule with cadmium plug, round loose-set scoriated tractor cover.

In Outside Lines: 4280 cast iron head and ferrule with cadmium plug. Terminate at grade or pavement in 18" x 18" x 6" concrete pad with tooled edges.

In Accessible Unfinished Spaces: 4400 or 4510 cast iron with cadmium plug, as appropriate.

In Finished Walls: 4530 cast iron cleanout tee with cadmium plug and stainless steel wall plate cover. Where distance from plug to finish wall will exceed 4 inches provide 4407 extended over from sanitary tee to bring plug within 4 inches.

- 4.3. Floor Drains: Size outlets same as pipe to which they connect. Install temporary closures during construction. Each drain connected to sanitary sewer shall have deep seal P-trap. Provide types as scheduled below. Where indicated on the drawings and elsewhere required by local and/or state Codes, provide readily accessible trap seal primer, complete with all accessories including water supply. Primer shall be located to facilitate servicing.

Where drains occur above finished spaces, furnish with clamping collar to secure waterproof membrane.

Typical Floor Drains: Series 2010B two piece cast iron drains with caulk type outlet and adjustable Nikaloy strainer and rim. Strainer tops for 2" drains 5" x 5", for 3" drains 6" x 6", for 4" drains 8" x 8".

Mechanical Room Drains: Series 2230 cast iron drain with caulk outlet, sediment bucket and cast iron grate.

## PART 5. WATER PIPING

- 5.1. Scope: Connect to existing water main as indicated and extend to all plumbing fixtures, hose bibbs, water heaters, etc.; and to HAC, laboratory, and special equipment as indicated or required.
- 5.2. General Workmanship: Cut accurately to measurements established at site and work into place without springing or forcing, properly clearing all openings, finished ceilings, etc. Route through previously built in sleeves and avoid excessive cutting or other weakening of the structure. Ream all pipe to remove burrs. Make changes in direction and size with fittings. Cap or plug open pipe ends during installation to keep out foreign material. Make connections carefully to insure unrestricted flow, eliminate air pockets, and to permit complete drainage of the systems. Supply piping to fixtures, faucets, hydrants, shower heads and flush valves shall be anchored to prevent movement. Install all buried piping with at least 36" of earth cover. All piping below slab-on-grade construction shall be installed in plastic jacket equal to Plasti-sleeve, as manufactured by Plastic Products Co. of Stanton, California.
- 5.3. Freeze Protection: Do not install piping in spaces subject to freezing. Install piping within building insulation envelope.
- 5.4. Grading: Grade pipe upward from source to facilitate drainage and air relief. Where low points are required because of long runs or where sections may be valved off, provide with 3/4" globe valve and hose nipple for drainage at low point. Make all connections to risers and fixtures from top of mains.
- 5.5. Nipples: Of same material as pipe in which they are installed; provide extra strong when unthreaded portion is less than 1 inch long.
- 5.6. Air Chambers: Install 18" long air chambers full size of riser at each fixture and terminate with standard pipe caps.

Where indicated on the drawings, and where quick closing valves occur, provide factory fabricated P.D.I. rated and approved heavy duty stainless steel construction water hammer arrestors (shock absorbers).

- 5.7. Piping: Typical lines to be of copper tubing meeting ASTM B-88, Type "L" hard above ground and Type "K" soft below ground. Make up joints with sweat fittings of wrought copper, and 95-5 or Harris "BRIDGIT" lead free solder; clean surfaces with steel wool or emery cloth before applying. Do not make joints or branch connections below a slab on grade.

NOTE: Solder shall be no lead bearing type and shall comply with ASTM B-32-89 Spec.

- 5.8. Utility Connection: Make water connection to existing as indicated.
- 5.9. Water Pressure: Supply system is designed for static pressure of 50 to 75 psi. Gauge city water supply adjacent to building to verify that pressure is within those limits. Submit report in writing. Provide water pressure reducing valve, if required, to meet designed water pressure.
- 5.10. Disinfection: Disinfect the entire distribution system as required by The International Plumbing Code, the City Water Works and The Alabama State Board of Health before acceptance for domestic operation. Prior to the final site visit, the contractor shall provide to the architect a letter stating the status of the disinfection of the domestic water system.

- 5.11. System Drainage: Provide valves and hose nipple to allow for drainage of all risers and other system low points.

## PART 6. WATER PIPING SPECIALTIES

- 6.1. General: All valves in insulated piping, temperature wells, pressure wells and similar items shall be provided with extended stems, operators, etc. as required to provide a minimum of 1" of clearance between the outside of the insulation jacket and the valve handle, well nipples, etc.. Seal the opening where the stem, nipple, etc., penetrates the the insulation as required to maintain the insulation.

- 6.2. Unions: 150 lb. rated; cast brass ground-joint type in copper pipe, galvanized malleable iron in wrought iron or galvanized pipe. Provide in all sizes of threaded pipe, and in sweat-jointed pipe over 1 inch, so as to facilitate easy repairs. In such lines install adjacent to water heaters, pumps, tanks, etc. into which piping is terminated; and on at least one side of valves, cocks, strainers, etc. and other devices which occur in piping runs.

Provide dielectric unions between ferrous and non-ferrous piping (including piping and water heater stubs where different).

- 6.3. Valves: Provide where shown and/or specified, including all fixtures or equipment not furnished with stops. All valves of each type shall be the product of one manufacturer, Nibco units as indicated below, or equals by Crane-Stockham, Kttz, Nibco or Jenkins. All valves shall be rated equivalent to Nibco Figure numbers. Arrange and install valves to be readily accessible for servicing.

Gate Valves 2" and smaller: #S-134 Class 150 WSP bronze solder-joint #T-134 for threaded pipe.

Over 2": F-617-0 iron body flanged type with bronze trim, 125 WSP.

Globe Valves 2". and smaller: #S-235-Y bronze solder-type with replaceable disc, T-235-Y for threaded pipe, 150 WSP.

Over 2": F-718-Y iron body flanged type with replaceable disk, 125 WSP.

Check Valves 2" and smaller: T-473-B bronze threaded, Y-Pattern swing check, 200 WSP.

Over 2": F-918-B iron body flanged type with bronze trim, 125 WSP.

Ball Valves for Water Piping in Size ½" through 3": Nibco S-585 or Apollo series 70-100/200 with 2-¼" extended stems, two-piece bronze body, ASTM B-21 Alloy C hard brass ball, Buna-N seat, Buna-N seals and lever type operating handle.

- 6.4. Strainers: 2" and smaller shall be Crane No. 988-½, iron body screwed, Y-Pattern, 125 WSP sediment separators with a 20 mesh model screen. Over 2" shall be Crane No. 989 ½ of same construction as above. Equal strainers by Mueller, Chase, Nibco, Watts or Jenkins will be approved.
- 6.5. Shock Absorbers: Certified by Plumbing and Drainage Institute Standard PDI-WH201 designed for 150 PSI min. working pressure. Provide where indicated.
- 6.6. Thermometers: "Any angle" type with 9 inch scale and suitable temperature range, as manufactured by Tterice type BX. Thermometers shall be mercury actuated with Phenol Condensate, and cast aluminum or brass cases and 6" socket with extension neck. Locate

for convenient reading. Equal product by Weskler, March or Maxwell Moore will be accepted.

- 6.7. Pressure Gages: Bourdon tube type, equal to Trerice No. 600, each complete with cast aluminum case, #870 vibration or pulsation snubber, #735 needle valve. Gage dials shall be not less than 4-½" and cases shall be of aluminum alloy. Furnish with suitable pressure ranges for each application. Equal products by Weskler, Marsh or Trerice will be accepted.
- 6.8. Wall Hydrants (typical): Freezeproof ¾" box type bronze hose bibb with loose key, JR Smith 5509 QT or approved equal, with integral vacuum breaker. Install approximately 18" above finished grade.
- 6.9. Wall Hydrants Inside the Building: Woodford #24 with key, or approved equal, with Watts #8 vacuum breaker.
- 6.10. Automatic Drain Trap Primer Units: Equal to Sloan F-72-A1. Units shall comply with International Plumbing Code and local codes. Allow for required modifications to meet local codes. Units shall be accessible for service. Provide required piping and drainage.
- 6.11. Pressure-reducing Valve and Strainer: Watts Series 223S or equal by Powers, Cash or others. Provide full size valved bypass around PRV, two pressure gauges, hose bibb and a valve and union on each side of PRV. Provide if required to meet designed water pressure.

## PART 7. PIPE HANGERS AND SUPPORTS

- 7.1. General: Refer to Section 15010.
- 7.2. Painting: Clean and paint with two coats of black latex paint all exposed ferrous metal parts of hangers, unistrut and other assemblies used for supporting of ducts, piping and plumbing related items in mechanical rooms, crawl space, above ceilings, etc. Include black steel pipe, uncoated cast iron pipe, hangers, brackets, etc.. In lieu of painting, the contractor may substitute factory painted or coated items. All paints and coatings shall comply with 25/50 smoke and flame spread requirements when located in a return air plenum.

## PART 8. GAS DISTRIBUTION SYSTEM

- 8.1. Scope: Make house supply connection to existing as indicated and extend to all gas fired equipment as well as other locations shown.
- 8.2. House Supply Connections: Cap at point shown. Liquefied petroleum gas storage tank and connection thereto will be by others.
- 8.3. Installation Generally: Comply with local gas code, requirements of local utility company, and NFPA Standard #54. Cut pipe accurately to measurements established at site and work into place without springing or forcing. Avoid runs through solid walls or floors. Route through previously built in sleeves and avoid excessive cutting or other weakening of the structure. Ream all piping to remove burrs. Make changes in direction and size with fittings. Make take-offs from top or sides of mains, not from bottoms. Cap or plug open pipe ends during installation to keep out foreign material. Lay out and grade work (1/4" in 15 feet min.) to avoid trapped lines; where unavoidable provide 4-inch drip leg with removable cap at low point. Use joint compound sparingly, applying to male threads only. Provide complete system testing per NFPA 54. Provide combination stop valve and insulating union at each point piping drops to underground or rises above grade from underground.

Provide unions and hangers same as specified under Water Piping Specialties.



- 8.4. Interior and Above Grade Piping: ASTM A53, seamless, Schedule 40 black steel pipe with black malleable iron screwed fittings for 2" and smaller.
- 8.5. Connections: Provide plug cock and pipe union in supply connection to each piece of equipment, RESUN #1430 semi-steel or equal for sizes 2" and smaller and 1431 flanged for sizes over 2". Where final connection is specified under another Section, cap off within 3 feet of input point. Provide flanges for piping 2 1/2" and larger, 150 lb., black forged steel, welding ASTM A181, Grade I, 1/16" raised face. (Use flat face when connected to flat face companion flange). Provide service cut-off valve in each service line to the building.
- 8.6. Lines Under Slab or in Unvented Spaces: Install in X-TRU-Coated steel pipe with vent to outside (Atmosphere).
- 8.7. Electrical Bonding and Grounding: The gas piping system within the building shall be electrically continuous and bonded to a grounding electrode as required by NFPA 70.
- 8.8. Shutoff Valve: Main gas shutoff valve controlling the gas piping system shall be easily accessible for operation and shall be installed in each service line as indicated, protected from physical damage, and marked with a metal tag to clearly identify the piping system controlled.

## PART 9. PIPE INSULATION

- 9.1. General Provisions: All work by experienced insulation subcontractor in accordance with manufacturer's recommendations. Piping must be clean, dry and pressure tested before covering is applied. Size pipe hangers to fit insulated pipe size. See "Pipe Hangers and Supports". Cover fittings, valves and flanges with insulation material as hereinafter specified to same thickness as adjacent pipe covering except screwed unions in hot piping and other specifically named items. Neatly bevel covering edges adjacent to unions and other points of termination. All insulation material (including coatings, mastics, jackets and adhesives) shall have a composite flame spread rating not to exceed of 25 (with no fuel contributed and smoke developed) as determined by ASTM E-84, NFPA 255 and UL 723.
- 9.2. Scope: Insulate all hot and cold water piping except that below grade, and excluding plated brass fixture connections. Insulate all p-traps located in return air plenums, horizontal overhead drain lines, including p-traps, from mechanical room floor drains, and other condensate receiving floor drains, to the respective riser same as cold water piping. Include floor drain sump and vertical pipe connection.
- 9.3. Insulation: Glass fiber insulation, Certainteed Snap-on, ASJ-SSL with kraft-foil-laminated jacket, or equivalent by Owens-Corning or JM. Apply by sealing longitudinal jacket flaps and jacket bands (butt strips) with adhesive and with insulation staples on 4" centers. Provide 3" wide jacket material butt strips at joints and at mid-points of lengths. Seal staples on cold piping with Foster 30-35 mastic.  
  
Insulation thickness shall be 1.0".
- 9.4. Fittings: Insulate with Fiberglas low pressure pipe covering mitered to fit snugly or fiberglass inserts of the same thickness as the pipe covering. Regardless of method used, each shall be finished with premolded PVC covers.
- 9.5. Exposed Ends: Finish open ends of sectional covering by rounding off with cement, and sizing with fiberglass cloth jacket around the pipe and finish with Foster 30-36 mastic cement.
- 9.6. At Walls and Floors: Refer to Section 15010 Pipe Sleeves. In any case insulation shall extend through floors, partitions and walls.

- 9.7. Underground Hot Water Piping: Insulate with 3/4" thickness Armstrong Armaflex or equal pipe insulation. Seal all joints with Armaflex 520 sealer.
- 9.8. Electric Water Coolers: Insulate drain connections and traps with 1/8" thick insulating tape by Presstite Engineering Company, St. Louis, Missouri.
- 9.9. At Hangers: Protect covering with 10-inch long section of 22 gauge galvanized steel formed in a half circle to fit the insulation. For pipe size over 2" provide factory fabricated thermal hanger shields, equal to Pipe Shields, Inc. series "Thermal-Hanger-Shields" utilizing insulation thickness and vapor barrier jacket specified for insulation.
- 9.10. Painting: Paint exposed insulation after insulation is completed as specified in Section 15010.
- 9.11. Subcontractor: Pipe insulation shall be installed by an established insulation contractor.

## PART 10. FIXTURES SUPPORTS, CONNECTIONS AND MOUNTING HEIGHTS

- 10.1. General: All fixtures including lavatories, urinals, water closets, electric water coolers, etc., must be securely fastened to the walls or floor.
- 10.2. Wall Mounted Fixtures: Support all wall mounted fixtures except water closets, with 3/16" thick 3 1/2" high plates full length of fixture, mounted behind wall. Where fixtures are back to back on a solid wall, mount with bolts from fixture hanger to fixture hanger. Do not use toggle bolts or expansion bolts except as noted.

Where fixtures are mounted on solid (single wythe) walls finished both sides, install fixtures with plated toggle bolts.

Where fixtures are mounted on wood or light gauge steel studs, employ pressure treated blocking of 2 x 10 nominal size well secured into stud line with non-corrosive fasteners. Fit behind stud flanges, using especially placed studs as required.

- 10.3. Floor Connections: Provide cast iron or galvanized malleable iron floor flanges at least 3/16" thick, screwed or caulked to drainage pipe. Bolt the connection and make tight to fixture with plumbing fixture setting compound, wax setting ring or polyethylene gasket flange.
- 10.4. Water Supply Connections: Provide brass nipple from water riser to fixture stop valve (steel pipe will not be approved). Exposed portion of nipple shall be chromium plated.
- 10.5. Waste Arms to Fixtures: As specified hereinbefore. Where copper or brass pipe is specified, all joint downstream from trap shall have soldered joints.
- 10.6. Mounting Heights: urinals (unless indicated otherwise) – 24" to lip  
urinals for handicap adults – 17" to lip

EWC for handicap adults – 34" to spout

lavatories (unless indicated otherwise) – 31" to rim  
lavatories for handicap – 34" to rim

EWC (unless indicated otherwise) – 40" to rim

water closets (handicapped) 17" to 19" to top of seat

## PART 11. SCHEDULED FIXTURES AND MISCELLANEOUS ITEMS

- 11.1. Acceptable Manufacturers: Fixtures listed are from American Standard and Elkay Catalogs. Equivalent products by Toto, Crane, Kohler, Eljer, Beneke, Olsonite, Zurn, EBC, Just, Church or Sperzel will be accepted.
- 11.2. Fixture Trim: Exposed metal parts to be of heavy weight polished brass, heavily chromium plated, of best quality as regularly furnished by the plumbing fixture manufacturer. Provide stop valve in supply to all fixtures and equipment.
- 11.3. Compliance with Americans Disabilities Act: All handicapped fixtures, faucets, flush valves, clearances, and installation shall comply with requirements of the Americans Disabilities Act.
- 11.4. Scheduled Items:

P – 1 Water Closet: AS New Madera 2234.015 1.6 GPF vitreous china, siphon jet, elongated bowl with 1 1/2" top spud, china bolt caps, Sloan No. 111 FYVQ flush valve and Beneke 527 CH-SS/HPSS white open-front seat with self sustaining stainless steel hinge. Provide chrome plated split-ring wall bracket for supply pipe.

P – 2 Handicapped Water Closet: AS Madera #2305.10, 1.6 GPF 16- 1/2" high vitreous china, siphon jet, elongated bowl with 1 1/2" top spud, china bolt caps, Sloan Royal No. 111YV flush valve and Beneke 527 CH-SS/HPSS white open-front seat with self sustaining stainless steel hinge. Provide chrome plated split-ring wall bracket for supply pipe. Coordinate flush valve installation with grab bar. Flush valve control/handle shall be mounted for use from the wide side of the toilet stall. Finished floor to top of seat shall be 17" to 19".

P – 3 Urinal: AS 6541.132 vitreous china siphon jet, flushing rim urinal, Sloan Royal 186-FYVQ flush valve with vacuum breaker, 3/4" top spud and Zurn series Z-1222 carrier. Provide chrome plated split-ring wall bracket for supply pipe.

P – 4 Handicapped Urinal: AS 6541.132 vitreous china siphon jet urinal 3/4" top spud, Sloan Royal 186-FYQV flush valve with vacuum breaker and Josam Series 17810 carrier. Finished floor to rim shall be set at 17". Provide chrome plated split-ring wall bracket for supply pipe.

P – 5 Lavatory: AS Lucerne 0355.012, 20" x 18" vitreous china lavatory with Delta 523HDF faucet and drain, McGuire #2165 supplies with stops, and McGuire 8872 1-1/4" chromium plated cast brass p-trap with cleanout and chromium plated 17 gauge tubing drain to wall with escutcheon. Provide heavy-duty floor support equal to J.R. Smith 0710 chair carrier with concealed arms.

P – 6 Handicapped Lavatory: A.S. Lucerne 0355.012, 20" x 18" vitreous china lavatory complete with Delta 523 HDF faucet and drain, McGuire #2167, 1/2" supplies with stops, McGuire #155WC offset drains, McGuire 8872 p-trap and heavy-duty floor supported JR Smith Series 0710 chair carrier with concealed arms. The entire assembly shall comply with ADA and ANSI standards. Insulate supplies, trap and drain with "handicap lav-guard" insulation kit as manufactured by Truebro. Mounting height to rim shall be 34".

P – 7 Service Sink: Lakewell 7692.049, size 22" x 18" acid resisting enameled cast iron service sink with 8341.075 faucet with vacuum breaker, Brasscraft XR1720A supplies with stops, 7798.176 trap standard and stainless steel rim guard.

P – 8 Handicapped Electric Water Cooler: Oasis #P8AM, wall mounted wheel chair type with 8 gal/hr/50°F. capacity at standard rating conditions. Receptor and cabinet to be stainless steel. Furnish with 1-1/4" rough brass p-trap, 17 gauge brass tailpiece and waste

with wheelless stop valve. Equal unit by Halsey Taylor, White Westinghouse may be used. Mounting height to spout shall be 34". Unit shall comply with ANSI/NSF 61.

P – 9 Tankless Water Heater: Equal to EEMAX "EX355L", 3KW, 208V, 1 Ph, 60 Hz, complete with operating and safety controls, set for 110 degrees F. water supply temperature.

P – 10 Emergency Eye-Wash/Drench Hose: Equal to Guardian #G5014 wall mounted unit complete with two spray heads, stay open ball valve, 12' reinforced retractable coiled hose, wall mounting bracket and G3600 thermostatic mixing valve to deliver tepid water.

P – 11 Handicapped Electric Water Cooler: Oasis P8AMSL split level wall mounted wheelchair type with apron for upper unit and with 8 gal/hr/50°F capacity at standard rating conditions. Receptor and cabinet to be stainless steel. Furnish with 1-1/4" rough brass p-trap, 17 gauge brass tailpiece and waste with wheelless stop valve. Equal units by Halsey Taylor, White Westinghouse may be used.

P – 12 Sump Pump: Automatic electric unit, Stancor Oil Minder SE-40 Simplex, 1/3 H.P. motor, 115 V, 1 phase, 60 Hz. Capacity not less than 20 GPM at 20' discharge head. Unit shall be complete with oil sensor control system to monitor alert conditions, float switches, horn, oil detection probe, etc. Provide 18" diameter x 24" deep concrete basin with 4" concrete bottom, complete with 1½" type "K" copper discharge line with bronze swing check valve. Wiring connections specified under Electrical Division.

## PART 12. MISCELLANEOUS EQUIPMENT FURNISHED UNDER OTHER SECTIONS

- 12.1. General: Equipment indicated hereunder is to be furnished and set in place under another Section of the Specifications (or is to be so provided under a separate contract). Verify exact size and location of vents, waste and supply connections from approved rough-in drawings and/or catalog data sheets. Allow for modifications required by the shop drawings without additional cost to the Owner.

All water and gas connections are to be complete with stop valves.

- 12.2. HAC Equipment: Provide floor drains, indirect wastes, etc. as noted. Final connections specified under HAC Section.
- 12.3. Lab Fixtures, Sinks and Fume Hoods: All lab fixtures, sinks, fume hoods, etc. shall be furnished complete with faucets, drains, acid resisting polypropylene traps, gas cocks, vacuum breakers, overflow drains and in general all control and operating trim by equipment and fixture supplier (see Lab Equipment Section).

The Plumbing Contractor shall rough-in; provide acid-resisting polypropylene waste fitting from trap to sewer; provide service stop valves in all water supplies; gas cocks; other accessories, materials, labor and make all connections as required for a complete first class installation ready for operation. The Plumbing Contractor shall also install sinks in casework and assemble required piping, faucets, outlets and trim as outlined in Lab Equipment Section.

## PART 13. ACID NEUTRALIZING TANK

- 13.1. General: Contractor shall furnish and install high-density polyethylene neutralization tank. Tank shall be rotationally molded seamless construction, with flanged top and bolt-down cover, as supplied by Ensfield Industrial Corporation. Tank shall be equal to Ensfield Neutrack #T0055, having 55 gallon capacity, complete with 4" inlet and outlet, and 2" vent connection. Tank to be 22" di. X 36" high. Tank shall be installed in accordance with

manufacturer's recommendations. Provide heavy-duty manhole (full size) extension to finished grade and set in 6" thick concrete pad.

Contractor shall furnish and fill the tank prior to operation with approved neutralization agent such as limestone or marble chips, one to three inches in size, to a level just below the tank outlet. Water should be added to the tank after placement of neutralization agent.

Provide required anchors to prevent flotation.

## SECTION 15400

### PLUMBING

#### PART 1. GENERAL & MISCELLANEOUS

- 1.1. General Provisions: Section 15010 is applicable in full hereto. **No building materials or products which contain asbestos, formaldehyde, lead or mercury, as defined by OSHA and EPA, shall be utilized.**
- 1.2. Scope: Include all equipment, material and labor required for a complete operating plumbing, system and gas distribution, even though every item involved is not indicated. Refer to architectural drawings and verify all plumbing fixtures. Notify the architect prior to bid of any discrepancies.
- 1.3. Qualifications: Subcontractor shall be an established licensed plumber with satisfactory experience in at least 3 equivalent projects.
- 1.4. Electrical Work: All electric power wiring required for installation of equipment under this Section is specified under Electrical Division. Plumbing Contractor shall furnish and install all controls and control wiring as specified or required to properly complete the installation. Control conduit is specified under Electrical Division or shown on electrical drawings; all other control conduit shall be provided under this Section of the work. All electrical work performed under this Section shall meet requirements set forth in the Electrical Division.

#### PART 2. TESTS

- 2.1. General: Perform all tests in the presence of the Architect. Refer to Division One for Fuel, water and power required therefore. In absence of specific testing procedure comply with code requirements and/or nationally acceptable industry standards. Furnish written reports of all tests results specified to Architect.
- 2.2. Drainage and Vent System: Plug all openings, fill entire system with water to point of overflow and hold for at least one hour before inspection. System must remain full during the test without leakage. Each vertical stack with its branches may be tested separately, but any portion tested must have minimum ten-foot head.
- 2.3. Water Supply System: Test and secure acceptance of entire system before the piping or hot water storage heaters are insulated or otherwise concealed. Test as follows: disconnect and cap all outlets to plumbing fixtures and all other equipment not designed for the full test pressure. Fill the system with water; apply 150 psi hydrostatic pressure and hold for a minimum of two hours without pressure loss. All piping throughout shall be tight under test. Water piping shall remain under normal water pressure during construction except when freezing weather is expected.
- 2.4. Gas System: Apply 75 psi air test for a twenty-four (24) hour period without pressure loss through leakage. Test before tanks, equipment, appliances, etc. are connected.
- 2.5. Fixtures: Test for soundness, stability of support and satisfactory operation.

#### PART 3. SANITARY PIPING

- 3.1. Scope: Provide a system of soil, waste and vent piping connecting all plumbing fixtures, equipment, etc. to the house sewer, with consolidated vent connections extending through the building roof, all as shown on the drawings.
- 3.2. Utility Connection: Make connection to existing sewer main as indicated.
- 3.3. Soil, Waste and Vent Piping Inside the Building Walls and to Points Outside the Building as Indicated: Provide service weight hub-and spigot cast iron soil pipe and fittings for underground service and hubless for above ground service, meeting ASTM A-74 for hub and spigot and ASTM A-888 for hubless, coated inside and out. Pipe exposed within the building shall be uncoated outside and left clean for painting. Fittings to receive screwed pipe arms shall be recessed drainage type. Soil and waste pipe shall have long sweep connections. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

Joints for hub and spigot pipe shall be made with compression gaskets meeting ASTM C-564. Joints for hubless pipe and fittings shall be equal to MG couplings meeting ASTM A-48 and C-564, or Anaheim Foundry Husky Series "4000" heavy-duty couplings of Type 304 stainless steel.

Option: Contractor may use PVC schedule 40 DWV solid wall pipe and fittings meeting ASTM Standard D2665 and 1785 for above ground service and underground service. Use cast iron in areas used as return air plenums and fire rated assemblies. Paint all vents through roof with ceramic paint. All floor drains shall have deep seal p-trap. **"Cellcore" piping is not allowed.**

- 3.4. Laying Out Work: Vents from any fixture, when connected to a vent line serving other fixtures, shall be extended at least 6 inches above flood level rim of highest of such fixtures to prevent use of vent lines as a waste. Make changes in direction by appropriate use of 45 degree Y's, 1/2 Y's, or long sweep 1/4, 1/6, 1/8 or 1/16 bends. Sanitary T's or short 1/4 bends may be used on vertical stacks or drainage lines where change in direction of flow is from horizontal to vertical; except that long-turn TY's shall be used when two fixtures are installed back to back with common drain. Straight T's, Ells and Crosses may be used on vent lines. Make no change in direction of flow greater than 90 degrees. Where different sizes of drainage pipe or fittings are connected use standard increasers and reducers of proper size. Do not reduce size of drainage piping in direction of flow. Drilling and tapping of house drains, soil, waste or vent pipes, and use of saddle hubs and bands are prohibited. **All plumbing vents through the roof shall be located a minimum of 10'-0" away from all outside air intakes.** Coordinate all plumbing vents locations with the HVAC plans.

Do not begin work until elevation of final connection point is verified and grading of entire system can be determined (even if final connection is specified under another Section).

- 3.5. Hangers: Support cast iron pipe adjacent to each fitting and on centers not exceeding five feet with hangers as specified hereinafter. Rigidly support base of vertical runs with solid masonry or concrete.

At no-hub pipe, support as above, and in addition provide adequate sway bracing to stabilize all components of the system. Provide special support for fixture arms, closet bends, etc.

- 3.6. Grading: Uniform and not less than 1/8" PLF for pipe 4" and over, and not less than 1/4" PLF for 2" and 3" piping.
- 3.7. Roof Flashing: Roof penetrations are to be flashed by the roofing contractor, using materials as recommended by the roofing manufacturer and approved by the Architect. Coordinate work with Roofing Contractor. Offset vents as required to clear gravel guards and flashing courses. Extend vents 6" to 8" above roof level.

- 3.8. Waste Arms: Type K copper or IPS brass pipe typical; Schedule 40 PVC or IPS brass pipe at urinals.
- 3.9. Test Fittings: Not shown on the drawings; provide where required for partial tests.
- 3.10. Miscellaneous Joints: Where cast iron pipe joins clay or transite pipe, make joint by caulking with jute and filling (at one pouring) with hot compound meeting FS SS-C-608.

Use slip joints and unions only upstream from a trap seal.

- 3.11. Acid-Resisting Soil, Waste, and Vent Piping: Shall be equal to GSR "Fuseal" Flame Retardant polypropylene schedule 40 pipe and fittings. Make joints in strict accordance with manufacturer's recommendations. Use piping meeting ASTM E84 25/50 requirements for flame spread and smoke in all spaces used as plenum fusion joints below floor and mechanical joints above floor. Equal products as manufactured Pyrex glass, Duriron or CPVC will be accepted.

#### PART 4. DRAINAGE SPECIALTIES

- 4.1. Equivalent Products: Specialties by J.R. Smith, Josam, Zurn or Wade.
- 4.2. Cleanouts: Provide in sanitary piping at all changes in direction, at ends of branches, at intervals not exceeding 40 feet on straight runs, and elsewhere as shown. Cleanouts shall be full opening type, completely accessible. Size same as lines in which they occur, but not larger than 4 inch. Tees and extensions shall be of same weight as soil pipe. Plugs countersunk or raised head type with lead seals. Except as noted, catalog numbers are from J.R. Smith.

In Tile Floors: 4040, adjustable, cast iron body with cadmium plug and satin finished square scoriated Nikaloy top; where soft tile occurs provide 4160 recessed square Nikaloy cover.

In Concrete Floors: 4240, adjustable head, cast iron head and ferrule with cadmium plug, round loose-set scoriated tractor cover.

In Outside Lines: 4280 cast iron head and ferrule with cadmium plug. Terminate at grade or pavement in 18" x 18" x 6" concrete pad with tooled edges.

In Accessible Unfinished Spaces: 4400 or 4510 cast iron with cadmium plug, as appropriate.

In Finished Walls: 4530 cast iron cleanout tee with cadmium plug and stainless steel wall plate cover. Where distance from plug to finish wall will exceed 4 inches provide 4407 extended over from sanitary tee to bring plug within 4 inches.

- 4.3. Floor Drains: Size outlets same as pipe to which they connect. Install temporary closures during construction. Each drain connected to sanitary sewer shall have deep seal P-trap. Provide types as scheduled below. Where indicated on the drawings and elsewhere required by local and/or state Codes, provide readily accessible trap seal primer, complete with all accessories including water supply. Primer shall be located to facilitate servicing.

Where drains occur above finished spaces, furnish with clamping collar to secure waterproof membrane.

Typical Floor Drains: Series 2010B two piece cast iron drains with caulk type outlet and adjustable Nikaloy strainer and rim. Strainer tops for 2" drains 5" x 5", for 3" drains 6" x 6", for 4" drains 8" x 8".



Mechanical Room Drains: Series 2230 cast iron drain with caulk outlet, sediment bucket and cast iron grate.

## PART 5. WATER PIPING

- 5.1. Scope: Connect to existing water main as indicated and extend to all plumbing fixtures, hose bibbs, water heaters, etc.; and to HAC, laboratory, and special equipment as indicated or required.
- 5.2. General Workmanship: Cut accurately to measurements established at site and work into place without springing or forcing, properly clearing all openings, finished ceilings, etc. Route through previously built in sleeves and avoid excessive cutting or other weakening of the structure. Ream all pipe to remove burrs. Make changes in direction and size with fittings. Cap or plug open pipe ends during installation to keep out foreign material. Make connections carefully to insure unrestricted flow, eliminate air pockets, and to permit complete drainage of the systems. Supply piping to fixtures, faucets, hydrants, shower heads and flush valves shall be anchored to prevent movement. Install all buried piping with at least 36" of earth cover. All piping below slab-on-grade construction shall be installed in plastic jacket equal to Plasti-sleeve, as manufactured by Plastic Products Co. of Stanton, California.
- 5.3. Freeze Protection: Do not install piping in spaces subject to freezing. Install piping within building insulation envelope.
- 5.4. Grading: Grade pipe upward from source to facilitate drainage and air relief. Where low points are required because of long runs or where sections may be valved off, provide with 3/4" globe valve and hose nipple for drainage at low point. Make all connections to risers and fixtures from top of mains.
- 5.5. Nipples: Of same material as pipe in which they are installed; provide extra strong when unthreaded portion is less than 1 inch long.
- 5.6. Air Chambers: Install 18" long air chambers full size of riser at each fixture and terminate with standard pipe caps.

Where indicated on the drawings, and where quick closing valves occur, provide factory fabricated P.D.I. rated and approved heavy duty stainless steel construction water hammer arrestors (shock absorbers).

- 5.7. Piping: Typical lines to be of copper tubing meeting ASTM B-88, Type "L" hard above ground and Type "K" soft below ground. Make up joints with sweat fittings of wrought copper, and 95-5 or Harris "BRIDGIT" lead free solder; clean surfaces with steel wool or emery cloth before applying. Do not make joints or branch connections below a slab on grade.

NOTE: Solder shall be no lead bearing type and shall comply with ASTM B-32-89 Spec.

- 5.8. Utility Connection: Make water connection to existing as indicated.
- 5.9. Water Pressure: Supply system is designed for static pressure of 50 to 75 psi. Gauge city water supply adjacent to building to verify that pressure is within those limits. Submit report in writing. Provide water pressure reducing valve, if required, to meet designed water pressure.
- 5.10. Disinfection: Disinfect the entire distribution system as required by The International Plumbing Code, the City Water Works and The Alabama State Board of Health before acceptance for domestic operation. Prior to the final site visit, the contractor shall provide to the architect a letter stating the status of the disinfection of the domestic water system.

- 5.11. System Drainage: Provide valves and hose nipple to allow for drainage of all risers and other system low points.

## PART 6. WATER PIPING SPECIALTIES

- 6.1. General: All valves in insulated piping, temperature wells, pressure wells and similar items shall be provided with extended stems, operators, etc. as required to provide a minimum of 1" of clearance between the outside of the insulation jacket and the valve handle, well nipples, etc.. Seal the opening where the stem, nipple, etc., penetrates the the insulation as required to maintain the insulation.

- 6.2. Unions: 150 lb. rated; cast brass ground-joint type in copper pipe, galvanized malleable iron in wrought iron or galvanized pipe. Provide in all sizes of threaded pipe, and in sweat-jointed pipe over 1 inch, so as to facilitate easy repairs. In such lines install adjacent to water heaters, pumps, tanks, etc. into which piping is terminated; and on at least one side of valves, cocks, strainers, etc. and other devices which occur in piping runs.

Provide dielectric unions between ferrous and non-ferrous piping (including piping and water heater stubs where different).

- 6.3. Valves: Provide where shown and/or specified, including all fixtures or equipment not furnished with stops. All valves of each type shall be the product of one manufacturer, Nibco units as indicated below, or equals by Crane-Stockham, Kttz, Nibco or Jenkins. All valves shall be rated equivalent to Nibco Figure numbers. Arrange and install valves to be readily accessible for servicing.

Gate Valves 2" and smaller: #S-134 Class 150 WSP bronze solder-joint #T-134 for threaded pipe.

Over 2": F-617-0 iron body flanged type with bronze trim, 125 WSP.

Globe Valves 2" and smaller: #S-235-Y bronze solder-type with replaceable disc, T-235-Y for threaded pipe, 150 WSP.

Over 2": F-718-Y iron body flanged type with replaceable disk, 125 WSP.

Check Valves 2" and smaller: T-473-B bronze threaded, Y-Pattern swing check, 200 WSP.

Over 2": F-918-B iron body flanged type with bronze trim, 125 WSP.

Ball Valves for Water Piping in Size ½" through 3": Nibco S-585 or Apollo series 70-100/200 with 2-¼" extended stems, two-piece bronze body, ASTM B-21 Alloy C hard brass ball, Buna-N seat, Buna-N seals and lever type operating handle.

- 6.4. Strainers: 2" and smaller shall be Crane No. 988-½, iron body screwed, Y-Pattern, 125 WSP sediment separators with a 20 mesh model screen. Over 2" shall be Crane No. 989 ½ of same construction as above. Equal strainers by Mueller, Chase, Nibco, Watts or Jenkins will be approved.
- 6.5. Shock Absorbers: Certified by Plumbing and Drainage Institute Standard PDI-WH201 designed for 150 PSI min. working pressure. Provide where indicated.
- 6.6. Thermometers: "Any angle" type with 9 inch scale and suitable temperature range, as manufactured by Tterice type BX. Thermometers shall be mercury actuated with Phenol Condensate, and cast aluminum or brass cases and 6" socket with extension neck. Locate

for convenient reading. Equal product by Weskler, March or Maxwell Moore will be accepted.

- 6.7. Pressure Gages: Bourdon tube type, equal to Trerice No. 600, each complete with cast aluminum case, #870 vibration or pulsation snubber, #735 needle valve. Gage dials shall be not less than 4-½" and cases shall be of aluminum alloy. Furnish with suitable pressure ranges for each application. Equal products by Weskler, Marsh or Trerice will be accepted.
- 6.8. Wall Hydrants (typical): Freezeproof ¾" box type bronze hose bibb with loose key, JR Smith 5509 QT or approved equal, with integral vacuum breaker. Install approximately 18" above finished grade.
- 6.9. Wall Hydrants Inside the Building: Woodford #24 with key, or approved equal, with Watts #8 vacuum breaker.
- 6.10. Automatic Drain Trap Primer Units: Equal to Sloan F-72-A1. Units shall comply with International Plumbing Code and local codes. Allow for required modifications to meet local codes. Units shall be accessible for service. Provide required piping and drainage.
- 6.11. Pressure-reducing Valve and Strainer: Watts Series 223S or equal by Powers, Cash or others. Provide full size valved bypass around PRV, two pressure gauges, hose bibb and a valve and union on each side of PRV. Provide if required to meet designed water pressure.

## PART 7. PIPE HANGERS AND SUPPORTS

- 7.1. General: Refer to Section 15010.
- 7.2. Painting: Clean and paint with two coats of black latex paint all exposed ferrous metal parts of hangers, unistrut and other assemblies used for supporting of ducts, piping and plumbing related items in mechanical rooms, crawl space, above ceilings, etc. Include black steel pipe, uncoated cast iron pipe, hangers, brackets, etc.. In lieu of painting, the contractor may substitute factory painted or coated items. All paints and coatings shall comply with 25/50 smoke and flame spread requirements when located in a return air plenum.

## PART 8. GAS DISTRIBUTION SYSTEM

- 8.1. Scope: Make house supply connection to existing as indicated and extend to all gas fired equipment as well as other locations shown.
- 8.2. House Supply Connections: Cap at point shown. Liquefied petroleum gas storage tank and connection thereto will be by others.
- 8.3. Installation Generally: Comply with local gas code, requirements of local utility company, and NFPA Standard #54. Cut pipe accurately to measurements established at site and work into place without springing or forcing. Avoid runs through solid walls or floors. Route through previously built in sleeves and avoid excessive cutting or other weakening of the structure. Ream all piping to remove burrs. Make changes in direction and size with fittings. Make take-offs from top or sides of mains, not from bottoms. Cap or plug open pipe ends during installation to keep out foreign material. Lay out and grade work (1/4" in 15 feet min.) to avoid trapped lines; where unavoidable provide 4-inch drip leg with removable cap at low point. Use joint compound sparingly, applying to male threads only. Provide complete system testing per NFPA 54. Provide combination stop valve and insulating union at each point piping drops to underground or rises above grade from underground.

Provide unions and hangers same as specified under Water Piping Specialties.

- 8.4. Interior and Above Grade Piping: ASTM A53, seamless, Schedule 40 black steel pipe with black malleable iron screwed fittings for 2" and smaller.
- 8.5. Connections: Provide plug cock and pipe union in supply connection to each piece of equipment, RESUN #1430 semi-steel or equal for sizes 2" and smaller and 1431 flanged for sizes over 2". Where final connection is specified under another Section, cap off within 3 feet of input point. Provide flanges for piping 2 1/2" and larger, 150 lb., black forged steel, welding ASTM A181, Grade I, 1/16" raised face. (Use flat face when connected to flat face companion flange). Provide service cut-off valve in each service line to the building.
- 8.6. Lines Under Slab or in Unvented Spaces: Install in X-TRU-Coated steel pipe with vent to outside (Atmosphere).
- 8.7. Electrical Bonding and Grounding: The gas piping system within the building shall be electrically continuous and bonded to a grounding electrode as required by NFPA 70.
- 8.8. Shutoff Valve: Main gas shutoff valve controlling the gas piping system shall be easily accessible for operation and shall be installed in each service line as indicated, protected from physical damage, and marked with a metal tag to clearly identify the piping system controlled.

## PART 9. PIPE INSULATION

- 9.1. General Provisions: All work by experienced insulation subcontractor in accordance with manufacturer's recommendations. Piping must be clean, dry and pressure tested before covering is applied. Size pipe hangers to fit insulated pipe size. See "Pipe Hangers and Supports". Cover fittings, valves and flanges with insulation material as hereinafter specified to same thickness as adjacent pipe covering except screwed unions in hot piping and other specifically named items. Neatly bevel covering edges adjacent to unions and other points of termination. All insulation material (including coatings, mastics, jackets and adhesives) shall have a composite flame spread rating not to exceed of 25 (with no fuel contributed and smoke developed) as determined by ASTM E-84, NFPA 255 and UL 723.
- 9.2. Scope: Insulate all hot and cold water piping except that below grade, and excluding plated brass fixture connections. Insulate all p-traps located in return air plenums, horizontal overhead drain lines, including p-traps, from mechanical room floor drains, and other condensate receiving floor drains, to the respective riser same as cold water piping. Include floor drain sump and vertical pipe connection.
- 9.3. Insulation: Glass fiber insulation, Certainteed Snap-on, ASJ-SSL with kraft-foil-laminated jacket, or equivalent by Owens-Corning or JM. Apply by sealing longitudinal jacket flaps and jacket bands (butt strips) with adhesive and with insulation staples on 4" centers. Provide 3" wide jacket material butt strips at joints and at mid-points of lengths. Seal staples on cold piping with Foster 30-35 mastic.  
  
Insulation thickness shall be 1.0".
- 9.4. Fittings: Insulate with Fiberglas low pressure pipe covering mitered to fit snugly or fiberglass inserts of the same thickness as the pipe covering. Regardless of method used, each shall be finished with premolded PVC covers.
- 9.5. Exposed Ends: Finish open ends of sectional covering by rounding off with cement, and sizing with fiberglass cloth jacket around the pipe and finish with Foster 30-36 mastic cement.
- 9.6. At Walls and Floors: Refer to Section 15010 Pipe Sleeves. In any case insulation shall extend through floors, partitions and walls.

- 9.7. Underground Hot Water Piping: Insulate with 3/4" thickness Armstrong Armaflex or equal pipe insulation. Seal all joints with Armaflex 520 sealer.
- 9.8. Electric Water Coolers: Insulate drain connections and traps with 1/8" thick insulating tape by Presstite Engineering Company, St. Louis, Missouri.
- 9.9. At Hangers: Protect covering with 10-inch long section of 22 gauge galvanized steel formed in a half circle to fit the insulation. For pipe size over 2" provide factory fabricated thermal hanger shields, equal to Pipe Shields, Inc. series "Thermal-Hanger-Shields" utilizing insulation thickness and vapor barrier jacket specified for insulation.
- 9.10. Painting: Paint exposed insulation after insulation is completed as specified in Section 15010.
- 9.11. Subcontractor: Pipe insulation shall be installed by an established insulation contractor.

## PART 10. FIXTURES SUPPORTS, CONNECTIONS AND MOUNTING HEIGHTS

- 10.1. General: All fixtures including lavatories, urinals, water closets, electric water coolers, etc., must be securely fastened to the walls or floor.
- 10.2. Wall Mounted Fixtures: Support all wall mounted fixtures except water closets, with 3/16" thick 3 1/2" high plates full length of fixture, mounted behind wall. Where fixtures are back to back on a solid wall, mount with bolts from fixture hanger to fixture hanger. Do not use toggle bolts or expansion bolts except as noted.

Where fixtures are mounted on solid (single wythe) walls finished both sides, install fixtures with plated toggle bolts.

Where fixtures are mounted on wood or light gauge steel studs, employ pressure treated blocking of 2 x 10 nominal size well secured into stud line with non-corrosive fasteners. Fit behind stud flanges, using especially placed studs as required.

- 10.3. Floor Connections: Provide cast iron or galvanized malleable iron floor flanges at least 3/16" thick, screwed or caulked to drainage pipe. Bolt the connection and make tight to fixture with plumbing fixture setting compound, wax setting ring or polyethylene gasket flange.
- 10.4. Water Supply Connections: Provide brass nipple from water riser to fixture stop valve (steel pipe will not be approved). Exposed portion of nipple shall be chromium plated.
- 10.5. Waste Arms to Fixtures: As specified hereinbefore. Where copper or brass pipe is specified, all joint downstream from trap shall have soldered joints.
- 10.6. Mounting Heights: urinals (unless indicated otherwise) – 24" to lip  
urinals for handicap adults – 17" to lip

EWC for handicap adults – 34" to spout

lavatories (unless indicated otherwise) – 31" to rim  
lavatories for handicap – 34" to rim

EWC (unless indicated otherwise) – 40" to rim

water closets (handicapped) 17" to 19" to top of seat

## PART 11. SCHEDULED FIXTURES AND MISCELLANEOUS ITEMS

- 11.1. Acceptable Manufacturers: Fixtures listed are from American Standard and Elkay Catalogs. Equivalent products by Toto, Crane, Kohler, Eljer, Beneke, Olsonite, Zurn, EBC, Just, Church or Sperzel will be accepted.
- 11.2. Fixture Trim: Exposed metal parts to be of heavy weight polished brass, heavily chromium plated, of best quality as regularly furnished by the plumbing fixture manufacturer. Provide stop valve in supply to all fixtures and equipment.
- 11.3. Compliance with Americans Disabilities Act: All handicapped fixtures, faucets, flush valves, clearances, and installation shall comply with requirements of the Americans Disabilities Act.
- 11.4. Scheduled Items:

P – 1 Water Closet: AS New Madera 2234.015 1.6 GPF vitreous china, siphon jet, elongated bowl with 1 1/2" top spud, china bolt caps, Sloan No. 111 FYVQ flush valve and Beneke 527 CH-SS/HPSS white open-front seat with self sustaining stainless steel hinge. Provide chrome plated split-ring wall bracket for supply pipe.

P – 2 Handicapped Water Closet: AS Madera #2305.10, 1.6 GPF 16- 1/2" high vitreous china, siphon jet, elongated bowl with 1 1/2" top spud, china bolt caps, Sloan Royal No. 111YV flush valve and Beneke 527 CH-SS/HPSS white open-front seat with self sustaining stainless steel hinge. Provide chrome plated split-ring wall bracket for supply pipe. Coordinate flush valve installation with grab bar. Flush valve control/handle shall be mounted for use from the wide side of the toilet stall. Finished floor to top of seat shall be 17" to 19".

P – 3 Urinal: AS 6541.132 vitreous china siphon jet, flushing rim urinal, Sloan Royal 186-FYVQ flush valve with vacuum breaker, 3/4" top spud and Zurn series Z-1222 carrier. Provide chrome plated split-ring wall bracket for supply pipe.

P – 4 Handicapped Urinal: AS 6541.132 vitreous china siphon jet urinal 3/4" top spud, Sloan Royal 186-FYQV flush valve with vacuum breaker and Josam Series 17810 carrier. Finished floor to rim shall be set at 17". Provide chrome plated split-ring wall bracket for supply pipe.

P – 5 Lavatory: AS Lucerne 0355.012, 20" x 18" vitreous china lavatory with Delta 523HDF faucet and drain, McGuire #2165 supplies with stops, and McGuire 8872 1-1/4" chromium plated cast brass p-trap with cleanout and chromium plated 17 gauge tubing drain to wall with escutcheon. Provide heavy-duty floor support equal to J.R. Smith 0710 chair carrier with concealed arms.

P – 6 Handicapped Lavatory: A.S. Lucerne 0355.012, 20" x 18" vitreous china lavatory complete with Delta 523 HDF faucet and drain, McGuire #2167, 1/2" supplies with stops, McGuire #155WC offset drains, McGuire 8872 p-trap and heavy-duty floor supported JR Smith Series 0710 chair carrier with concealed arms. The entire assembly shall comply with ADA and ANSI standards. Insulate supplies, trap and drain with "handicap lav-guard" insulation kit as manufactured by Truebro. Mounting height to rim shall be 34".

P – 7 Service Sink: Lakewell 7692.049, size 22" x 18" acid resisting enameled cast iron service sink with 8341.075 faucet with vacuum breaker, Brasscraft XR1720A supplies with stops, 7798.176 trap standard and stainless steel rim guard.

P – 8 Handicapped Electric Water Cooler: Oasis #P8AM, wall mounted wheel chair type with 8 gal/hr/50°F. capacity at standard rating conditions. Receptor and cabinet to be stainless steel. Furnish with 1-1/4" rough brass p-trap, 17 gauge brass tailpiece and waste

with wheelless stop valve. Equal unit by Halsey Taylor, White Westinghouse may be used. Mounting height to spout shall be 34". Unit shall comply with ANSI/NSF 61.

P – 9 Tankless Water Heater: Equal to EEMAX "EX355L", 3KW, 208V, 1 Ph, 60 Hz, complete with operating and safety controls, set for 110 degrees F. water supply temperature.

P – 10 Emergency Eye-Wash/Drench Hose: Equal to Guardian #G5014 wall mounted unit complete with two spray heads, stay open ball valve, 12' reinforced retractable coiled hose, wall mounting bracket and G3600 thermostatic mixing valve to deliver tepid water.

P – 11 Handicapped Electric Water Cooler: Oasis P8AMSL split level wall mounted wheelchair type with apron for upper unit and with 8 gal/hr/50°F capacity at standard rating conditions. Receptor and cabinet to be stainless steel. Furnish with 1-1/4" rough brass p-trap, 17 gauge brass tailpiece and waste with wheelless stop valve. Equal units by Halsey Taylor, White Westinghouse may be used.

P – 12 Sump Pump: Automatic electric unit, Stancor Oil Minder SE-40 Simplex, 1/3 H.P. motor, 115 V, 1 phase, 60 Hz. Capacity not less than 20 GPM at 20' discharge head. Unit shall be complete with oil sensor control system to monitor alert conditions, float switches, horn, oil detection probe, etc. Provide 18" diameter x 24" deep concrete basin with 4" concrete bottom, complete with 1½" type "K" copper discharge line with bronze swing check valve. Wiring connections specified under Electrical Division.

## PART 12. MISCELLANEOUS EQUIPMENT FURNISHED UNDER OTHER SECTIONS

- 12.1. General: Equipment indicated hereunder is to be furnished and set in place under another Section of the Specifications (or is to be so provided under a separate contract). Verify exact size and location of vents, waste and supply connections from approved rough-in drawings and/or catalog data sheets. Allow for modifications required by the shop drawings without additional cost to the Owner.

All water and gas connections are to be complete with stop valves.

- 12.2. HAC Equipment: Provide floor drains, indirect wastes, etc. as noted. Final connections specified under HAC Section.
- 12.3. Lab Fixtures, Sinks and Fume Hoods: All lab fixtures, sinks, fume hoods, etc. shall be furnished complete with faucets, drains, acid resisting polypropylene traps, gas cocks, vacuum breakers, overflow drains and in general all control and operating trim by equipment and fixture supplier (see Lab Equipment Section).

The Plumbing Contractor shall rough-in; provide acid-resisting polypropylene waste fitting from trap to sewer; provide service stop valves in all water supplies; gas cocks; other accessories, materials, labor and make all connections as required for a complete first class installation ready for operation. The Plumbing Contractor shall also install sinks in casework and assemble required piping, faucets, outlets and trim as outlined in Lab Equipment Section.

## PART 13. ACID NEUTRALIZING TANK

- 13.1. General: Contractor shall furnish and install high-density polyethylene neutralization tank. Tank shall be rotationally molded seamless construction, with flanged top and bolt-down cover, as supplied by Ensfield Industrial Corporation. Tank shall be equal to Ensfield Neutrack #T0055, having 55 gallon capacity, complete with 4" inlet and outlet, and 2" vent connection. Tank to be 22" di. X 36" high. Tank shall be installed in accordance with

manufacturer's recommendations. Provide heavy-duty manhole (full size) extension to finished grade and set in 6" thick concrete pad.

Contractor shall furnish and fill the tank prior to operation with approved neutralization agent such as limestone or marble chips, one to three inches in size, to a level just below the tank outlet. Water should be added to the tank after placement of neutralization agent.

Provide required anchors to prevent flotation.



## SECTION 15700

### HEATING, AIR CONDITIONING & VENTILATING

#### PART 1. GENERAL

- 1.1. General Provisions: Section 15010 is applicable in full hereto. **No building materials or products which contain asbestos, formaldehyde, lead or mercury, as defined by OSHA and EPA, shall be utilized.**
- 1.2. Qualifications of Subcontractor: Must be properly licensed and established as a Heating and Air Conditioning Contractor at location of the work and shall maintain locally adequate service facilities. He shall have had previous experience in the satisfactory installation of at least three systems of this type and size.
- 1.3. Scope: Include all equipment, material, and labor required for complete and satisfactory operation of HVAC systems, even though every item involved is not indicated.
- 1.4. Safety Provisions: Provide covers or guards on all hot, moving and projecting items that could be a hazard to occupants of the building or to service personnel.
- 1.5. Warranty: Guarantee work as set forth in Section 15010.
- 1.6. Service, Charges, Grease, Filters, etc.: Furnish first charges of refrigerant, grease, oils, etc., and be responsible for such full charges for the guarantee period. Provide service and maintenance for all equipment and systems during the guarantee period, **including complete filter changes. Filter changes shall be done quarterly.** Make last service call two weeks prior to year end inspection and include lubrication of all motors, bearings, etc., calibration and adjustment of all controls, and new filters.

The Contractor shall furnish to the Architect individual written service reports for all work done under this warranty. As a minimum, quarterly reports are required.
- 1.7. Field Instructions: After completion of the work the Contractor shall operate all systems for a period of six (6) days. During this time provide competent personnel to thoroughly instruct representatives of the Owner in the proper operation and care of all equipment and control systems. Secure written acknowledgement of such training from the Owner.
- 1.8. Bound and Framed Instructions: **Two weeks before final inspection**, furnish three complete sets of operating and maintenance instructions, bound in hard cover, indexed and tabbed. The first sheet in the bound instructions shall be a list with each product, name, address and telephone number of:
  - a. Subcontractor or installer
  - b. Table of Contents listing all products in the order which they appear in the specifications and label the tab accordingly.
  - c. Local source of supply for parts and replacement
  - d. Include wiring and control diagrams with explanatory data; control sequence describing start-up, operation and shutdown; operating and maintenance instructions for each piece of equipment; manufacturer's bulletins and catalog data; parts list and recommended spare parts. Fold in large sheets of drawings.
  - e. Provide a list indicating all routine maintenance procedures based on the respective manufacturer's recommended intervals

- f. Provide drawings of system control and wiring diagrams, condensed operating instructions, and lubricating schedule and include in binder. All components shall be numbered and identified on diagram. Submit for approval; after approval, in addition to placing in the binder, frame under glass or plastic and mount on main equipment room wall where directed.

## PART 2. ELECTRICAL WORK AND EQUIPMENT

- 2.1. **Power:** All power wiring required for installation of equipment is specified under Electrical Division. Electrical equipment shall be compatible with the current shown on electrical drawings. Verify current characteristics before ordering equipment.
- 2.2. **Motors:** All motors furnished shall be designed, manufactured, and tested in accordance with the latest applicable standards of NEMA, ANSI, IEEE, and ASTM. As a minimum requirement, all motors shall conform to the latest applicable sections of NEMA Standard No. MG-1. Motors must meet or exceed The Consortium for Energy Efficiency (CEE) Premium Efficiency™ full load efficiencies. The Consortium for Energy Efficiency (CEE). All motors shall be listed under UL recognized component file as applicable. All motors shall be suitable for installation according to the requirements of NEC. Motors shall be wound for the specified voltage and a 1.15 service factor, 1750 RPM open dripproof construction unless otherwise shown or specified. The bearings shall have a rated fatigue life of B-10 of 150,000 hours for direct-coupled applications and 50,000 hours for belted applications minimum. Belted rating shall be based on radial loads and pulley sizes called out in NEMA MG 1. The calculation will be determined with the pulley centerline being at the end of the motor shaft. Load on motors shall not exceed 100% nominal horsepower. Routine factory testing shall be conducted in accordance with Method B of IEEE 112 (latest edition), Standard Test Procedure for Polyphase Induction Motors and Generators and shall be as described in Article 12.55 of NEMA MG1, Motors and Generators.

Per CEE Premium Efficiency Criteria, minimum efficiencies for ODP motors shall be equal to or greater than those shown below:

HP	1200 RPM	1750 RPM	3600 RPM
1	82.5	84.5	80.0
1.5	86.5	85.5	85.5
2	87.5	85.5	86.5
3	89.5	88.5	86.5
5	89.5	88.5	89.5
7.5	91.7	90.0	89.5
10	91.7	91.7	90.2
15	92.4	93.0	91.0
20	92.4	93.0	92.4
25	93.0	93.6	93.0
30	93.6	94.1	93.0
40	94.1	94.1	93.6
50	94.1	94.5	93.6
60	95.0	95.0	94.1
75	95.0	95.0	94.5
100	95.0	95.4	94.5
125	95.4	95.4	95.0
150	95.8	95.8	95.4
200	95.4	95.8	95.4

Where shown on the drawings, furnish Increment wound motors for 2 step starting.

All motors shall be provided with overload protection and phase protection on all legs. Do not run motors until correct overload elements are installed in starters.

Tradingoverload elements for elements of correct size for motors actually furnished shall be included in this Section. Premium efficient motors shall be warranted for 36 months. Motors shall be by Allis Chalmers, General Electric Goulds, Louis Allis, Westinghouse or approved equivalent. All motors serving outdoor equipment exposed to weather shall have TEFC motors meeting the requirements set forth previously.

- 2.3. Fusing: Provide factory installed fuses in all equipment requiring fusing for branch circuit protection.

- 2.4. Motor Starters: To be furnished under this Section; installation thereof is specified under Electrical Division, except for those which are specified to be factory assembled. Starters shall be Cutler-Hammer, Allen-Bradley, Square D or General Electric. Starters shall be U.L. and NEMA approved. Where required for interlocks provide built-in step down transformer. Motors for VFD drives shall be designed for NEMA MG-1, Part 30.

Provide for each motor or group of motors requiring a single control (and not controlled from a motor-control center), a suitable controller and devices that will function as specified for the respective motors.

Provide overload protection for each ungrounded conductor to each motor 1/8 HP or larger (manual reset type unless indicated otherwise). The overload-protection device shall be integral with the motor or controller. Unless indicated otherwise, furnish pilot lights with all remote starters. Where auxiliary control devices are connected into control circuit, these devices shall not bypass safety controls (motor-overload protective devices, high-pressure cutouts, low pressure cutouts, etc.). Provide "Hand Off - Auto" switches, auxiliary contacts, etc. for all starters.

- 2.5. Controls: HAC Contractor shall furnish and install all controls, and control and interlock wiring, as specified or required to properly complete the installation. Control conduit is specified in Electrical Division of the specifications and/or shown on electrical drawings. All other control conduit or power wiring for controls not shown on the electrical drawings or specified in the Electrical Division of the specifications shall be provided under this HVAC Section. All electrical work performed under this Section shall conform to requirements set forth in the Electrical Division of the specifications. All work shall be done a preapproved, independent HVAC controls subcontractor who's primary business is the installation and servicing of HVAC controls.

- 2.6. Controls and Instrumentation Cable: Instrumentation cable shall be 18 AWG stranded copper, single or multiple twisted, minimum 2 inch lay of twist, 100 percent shielded pairs and shall have a 300 volt insulation. Each pair shall have a 20 AWG tinned copper drain wire and individual overall pair insulation. Cables shall have an overall aluminum polyester or tinned copper cable shield tape, overall 20 AWG tinned copper cable drain wire and overall cable insulation. All wiring shall be in conduit except conduit is not required above lift-out (lay-in) ceilings. Provide supports, for all wiring not in conduit, to the building structural system (not other trades supports). Wiring, cabling, etc., shall be neatly bundle together at no more than six (6) feet on center. All wiring, cabling, etc., shall be plenum rated.

- 2.7. Wiring Diagrams: Furnish to the Electrical Contractor for the specific makes and models of electric-motor operated equipment to be installed.
- 2.8. Modifications: The cost of any modifications of the electrical power wiring and/or control wiring conduit required by heating, air conditioning or ventilation equipment or controls having electrical power requirements differing from that shown on the electrical drawings and/or as specified, shall be the responsibility of the Mechanical Contractor.
- 2.9. Grounding: Provide copper jumpers across all flexible connectors taking care that jumpers do not bind flexible connections. Jumpers shall be flat braid, minimum 3/8" wide, .03" thickness, 48 carriers, 288 total strands, 7200 nominal CMA, 12 AWG.

### PART 3. PLUMBING WORK

- 3.1. Floor Drains: By Plumbing Contractor. HAC Contractor shall provide drains from all air conditioning equipment drains, etc. to the floor drains dry wells.

### PART 4. VIBRATION AND NOISE CONTROL

- 4.1. General: Elimination of objectionable vibration and noise is the responsibility of the Contractor, who must provide all foundations, isolators, flexible connections, air chambers, etc. required thereby. Pay special attention to vibration problems at year end inspection and correct all deficiencies noted.

All items of mechanical equipment including air handling units, condensing units, rooftop package units and fans shall be properly isolated from the structure by means of approved vibration absorbing accessories, foundations or supports. Each foundation shall include an adequate number of standard isolation units.

### PART 5. TESTING

- 5.1. General: Conduct tests upon completion of the heating, air conditioning and ventilation installations and at times as designated by the Architect. Furnish all necessary personnel and test instruments. Power and fuel is specified under Division 1. Furnish written reports of all tests results specified to Architect.
- 5.2. Ductwork for Systems Over 3000 CFM Capacity: Test all supply, return and exhaust ducts, plenums and casings and make airtight before covering with external insulation or concealing in masonry. Test supply ductwork under the positive pressure for the respective system. Test return and exhaust ducts, plenum and casing under a positive pressure of 1" WG. Vacuum clean ducts, plenums, casings and coils. Demonstrate operation of fire dampers before testing and starting. Check that flexible connections are loose and not transmitting vibration.
- 5.3. Ductwork for Systems Up To 3000 CFM Capacity: Test all supply, return and exhaust ducts, plenums and casings and make substantially airtight before covering with external insulation or concealing masonry. Substantially airtight shall be construed to mean that no air leakage is noticeable to the senses of touch or sound at joints.
- 5.4. Refrigerant Piping: Test with CO2 gas or dry nitrogen and prove tight. Test high and low side of system at 300 psi. After evacuating the system and charging with refrigerant, test piping with a halide torch and prove tight under actual operating

conditions.

## PART 6. TESTING AND BALANCING AIR DISTRIBUTION SYSTEMS

- 6.1. Procedure: Test and balance all systems per Associated Air Balance Council National Standards for Total System Balance, Section IV, as applicable to air distribution. Employ instruments that have been calibrated within six months and checked for accuracy just prior to start of work. Provide for all work as specified in Section IV, Chapters 16, 17, 18, 21, and 24. The entire, current, AABC Standards Manual is applicable, as if written in full herein. Use manufacturer's data for pressure drops through coils, chillers, condensers, etc. and pump performance curves. The Contractor shall provide additional dampers, valves, drive changes, etc. as required to obtain specified results. Additionally, for refrigerant hot gas reheat coils, adjust humidistat so that coil valve opens. Provide the same data for refrigerant hot gas reheat coils as specified for AHU coils.

Setting of balancing valves and dampers shall be permanently marked so they can be reset at any time.

After building is occupied, make adjustments as requested by the Architect.

- 6.2. Seasonal Adjustments: At the beginning of the first heating season adjust and balance operating phases and repeat at the beginning of the first cooling season or vice versa.
- 6.3. Control Systems: In cooperation with the control subcontractor, calibrate, adjust, and test control system, including the refrigerant hot gas reheat coils, to show that the requirements of these specifications have been met. Provide a tabulation of setting on all controls indicating set point and throttling range or differential after controls and systems have been finally adjusted. Include settings on safety controls and cut-outs.

Include temperature of chilled water and/or hot water and discharge air from each AC unit and coil.

- 6.4. Testing of all Fire Dampers: Test all fire and smoke dampers by releasing holding mechanism and activation of smoke dampers and certify in writing that all dampers have been checked and perform correctly.
- 6.5. Report: Submit report with all performance data 10 days prior to final site visit. **No final inspection will be held until the Engineer has reviewed this report.**

## PART 7. SHEET METAL DUCT WORK (LOW VELOCITY 2" S.P.)

- 7.1. Scope: Provide as shown and as required for the air conditioning, heating and ventilation systems. Make changes in dimensions, offsets or crossovers as necessary to clear piping, lights and structural members, and to maintain scheduled headroom. Provide all accessories required. Refer to architectural drawings and specifications.
- 7.2. Protection of Interior of Duct From Debris: **ALL** open portions of ductwork and equipment shall be covered with a self-adhesive film to prevent the intrusion of contaminants. The material shall be a minimum of 3 mil thick and have a minimum tensile strength of 10 psi. it shall be blue in color, UV resistant and waterproof and recyclable. Open ends of ductwork shall be protected prior to delivery to the project

site. Any taps, take-offs, etc., shall be protected immediately after the tap, take-off, etc. has been made in the field. Material shall be DuroDyne Dyn-O-Wrap or approved equivalent. **This requirement will be strictly enforced. Any ductwork discovered to be unprotected as specified is subject to rejection for use on this project .**

- 7.3. Sizes: Take measurements at job and fit work into available space; report to the Architect any unworkable conditions encountered and alter layout or duct sizes as directed without additional cost to the Owner. Unless otherwise approved, conform to dimensions indicated. Duct dimensions shown indicate NET FREE AREA after installation of duct liner; increase sizes indicated to allow therefore.
- 7.4. Sheet Metal: ARMCO, or equal, prime quality galvanized sheet steel unless otherwise indicated on plans shall be gages as recommended in the latest edition of SMACNA "Duct Construction Standards", with long dimension or diameter not less than the following in any case:

Up to 18 inches	26 ga.
19 to 30 inches	24 ga.
31 to 54 inches	22 ga.
55 to 84 inches	20 ga.
85 to 96 inches	18 ga.

Where galvanized metal joins aluminum or copper, separate sheets with lead or chromate impregnated felt gaskets.

**Metal manufacturer's duct material stamp shall be visible on duct exterior surfaces. This requirement will be strictly enforced.**

- 7.5. General Fabrication: Construct and erect in a workmanlike manner, meeting requirement of the latest SMACNA "Duct Construction Standards" and NFPA Code 90A. Form straight and smooth on the inside, with joints neatly finished. Make up in section of such length that mechanic can reach thru open end to seal insulation at previous joint. Assemble and anchor so as to be completely free from vibration and drumming under all conditions of operation. Make takeoffs at round ducts with prefabricated round-to-rectangular and rectangular-to-round transitions. Break so that manufacturer's quality stamp is exposed to view. Fabricate to SMACNA Standards for 2" S.P.
- 7.6. Exposed Ductwork: Install tight against the wall and/or ceiling with drive slip joints. Where exposed ducts pass through walls and partitions, provide 4" wide 20 gauge galvanized steel closure plates except at grilles and registers. Closure plates shall fit snugly to duct and shall be secured to wall. All ductwork exposed to view in finished areas shall be primed and painted as directed by the architect. See spec section "Painting" for additional information.
- 7.7. Cross Joints, Seams and Stiffening: Join and stiffen with combination of joint types and structural angles as recommended in SMACNA "Duct Construction Standards". Cross break all flat areas over 18 inches wide. Install internal ends of slip joints in the direction of flow. Non-galvanized pieces must be painted before assembling with Rust-Oleum metal primer. All transverse joints with long dimension over 20" shall be made with all metal Ductmate joints system as manufactured by Ductmate Industries, Inc., Quikduc Transverse Duct Connection Systems, or approved equivalent. Ductmate system shall be installed in strict accordance with SMACNA and manufacturer's recommendations and instructions.

Make all cross joints and all branch, grille and diffuser take-offs, except Ductmate

joints, air tight by applying low VOC, LEED compliant, Hardcast Duct Seal 321 or approved equivalent duct sealer. Sealer shall meet and pass ASTM D-2202, ASTM C-731 and EPA regulations. Sealer shall meet the requirements for the pressure classification of the ductwork installed.

- 7.8. Turns and Transitions: Fabricate turns with an inside radius equal to width of duct. At 90 degree turns Contractor may substitute square elbows, with standard factory-made, multiple, double-blade constructed vanes. Vanes shall be a double wall, true airfoil contour with smoothly rounded entry nose with extended trailing edge. Vanes shall be formed from a single piece of 26 ga., hot dipped galvanized steel and shall be 3" radiused vanes on 2.4" centers. Vanes shall be provided with two (2) tie rods and continuous internal tubes for stiffening and rigidity. Maximum pressure drop shall be .06" W.G. at 1500 FPM. Generated sound power level shall not exceed 54 decibels in band 4 at 2000 FPM (24"x24" duct size). Vanes shall be as manufactured by Aero/Dyne Series HEP. Avoid abrupt changes in shape, with a slope of 4:1 the minimum allowed.
- 7.9. Unavoidable Obstructions: Where structural elements or pipes must pass through a duct, provide two-piece streamliners, and enlarge duct to compensate for net loss of area. Round pipes and rods smaller than 3 inches need not have special treatment. Streamliners and the item being streamlined shall be non-combustible. **Note:** This provision will not be used to justify obstructions that can be avoided. Under no circumstance shall any combustible item pass through ducts.
- 7.10. Branch Duct Dampers: Provide at all points where branch ducts take off from trunks, and where ducts divide. Refer to details on the drawings.
- 7.11. Fire Dampers: Provide as shown on drawings and in each duct passing through fire walls, floors, and other fire barriers in accordance with NFPA Code 90A. Refer to architectural drawings and provide additional dampers in fire rated walls at locations not shown on mechanical drawings. Install in such manner that fusible links can be replaced. Employ links rated at 165 degrees F (212 degrees where within 10 feet of a heating coil).

Typical dampers shall be UL labeled, minimum 1-1/2 hour rated, (higher where required), equal to Prefco #5500-E6-BC, with Type B low resistance frame and factory sleeve. Equal product by Air Balance, Russkin, American or Airstream Products will be accepted. Where damper is installed behind wall grilles or registers use No. 5500-E6-LPB.

Install in accordance with all applicable conditions of the UL listing, for which data sheets must be submitted for approval. At typical ducts provide 16 ga. Sleeves secured in opening with 1-1/2" x 1-1/2" x 14 ga. (min.) angles; bolt angles and damper sleeve with galvanized bolts. Size structural openings so that space between sleeve and masonry is not less than 1/8" or more than 1/2". Secure ducts to sleeve with sheet metal screws. After installation release holding mechanism and verify proper closure of each damper.

Ductwork in fire-rated floor-ceiling or roof-ceiling assembly system with air ducts that pierce the ceiling of the assembly shall be constructed in conformance with designs in UL Fire Resistance Directory. In general ducts shall be encased in fire rated material.

At internally insulated ducts, size dampers for gross duct size, so that liner butts into damper frame surround.

- 7.12. Volume Dampers: For round ducts not over 12 inches in either dimension: Single leaf, airfoil type, constructed with 18 gauge galvanized metal with locking type control quadrant and pivot rod extending through opposite side of duct with nylon sleeve bearings at both ends.
- 7.13. Volume Dampers: For ducts over 12", opposed blade, airfoil blades of 16 ga. Galvanized steel mounted in steel frames by steel trunions riding in bronze or nylon sleeve bearings. Blade width shall not exceed 10 inches and individual blade length shall not exceed 48 inches. Extend one trunion to permit operation from outside the duct. Provide manually operated dampers with cadmium plated steel locking quadrant. Dampers opening to the outside shall have felted edges.
- 7.14. Stand-Off Mounting Brackets: Locking-type quadrant operators for dampers, when installed on ducts to be externally insulated, shall be provided with stand off mounting brackets, bases or adapters to provide clearance between the duct surface and the operator not less than the thickness of the insulation. Stand off mounting items shall be integral with the operator or standard accessory of the damper manufacturer.
- 7.15. Access Doors: Provide in duct wall at each splitter, fire and motorized damper, at each of coil and strip heaters, smoke detectors, in plenums and elsewhere indicated or required for proper maintenance. Size and position so as to provide access to bearings, fire links, etc. Typical doors shall be double metal faced, internally insulated same as duct, provided with gasket seal, and held in place with four or more sash locks. Minimum size shall be 16" x 12".
- 7.16. Duct Instrument Test Holes: Provide for each system four test holes (two in supply duct and two in return air plenum) at opposite ends near air handling units with screwed caps. Also, at duct mounted coils and electric duct heaters provide one on either side of the coil or duct heater.
- 7.17. Flexible Connections: Connect all ducts to air handling units and fans excepting dome type fans with preassembled flexible connection of 29 ounce fire-resistant, neoprene coated glass fiber cloth equal to Ventfabrics "Ventglas" (6" fabric width), as manufactured by Ventfabrics, Wiremold or Thermoflex. Install so that the cloth is in folds (not drawn tight). Insulate flexible connectors externally to prevent condensation.
- 7.18. Register and Grille Connections: Where take-offs are in side of a duct, clinch lock short tee sections onto trunk. Install collars with slip joints and 3/4" flange at outlet end. At plastered surfaces set collars exactly flush with plaster surface (mechanic must be on job to make adjustments during plaster application). Set flange face so as to receive register gasket, and be concealed by register flange. Collars may be deleted where mounting frames are furnished with registers.

Install boots above lay-in ceilings simultaneously with ceiling work; mechanic must be on job during this phase of construction work.

At return relief and exhaust grilles 48" or more in either dimension, collars shall be 1 x 2 x 1/8 inch steel angle frames with corners mitered, welded and ground smooth. Frames in ceiling shall be independently suspended from the ceiling structure, or the duct shall have special reinforcing to prevent sagging of the boot.

Interior of ductwork visible through grilles and diffusers shall be painted flat black.

- 7.19. Hangers and Supports: Support small (less than 60 united (w+h) inches) horizontal ducts with 1-1/4" x 20 ga. Band hangers. Provide in pairs close to each transverse



joint and in no case more than six feet apart. Bands shall pass completely under round ducts. At rectangular ducts bands shall be turned 1" under the lower corner and fastened with self-tapping screws into the bottom surface and at 6" intervals up the sides. Loop top end of hangers over steel structural members above and fasten with galvanized bolts; where concrete joists occur overhead secure straps to side of joist with galvanized expansion or ramset bolts; where flat concrete surface occurs overhead secure with ramset or expansion bolt fasteners. See Section 0550 for limitations on use of powder driven fasteners.

Support horizontal ducts larger than or equal to 60 united (w + h) inches on trapeze type hangers, with structural supporting angle, 3/8 inch threaded rods and inserts or clamps as required to accommodate overhead construction. Spacing shall not exceed 8 feet.

Support small vertical runs with 1/8" steel bands screwed to 3 sides of duct and expansion bolted to adjacent structural elements; spacing shall not exceed 12 feet. Support vertical runs larger than 50 united inches with structural brackets with welded joints.

Where ducts pass through floors, seal as specified hereinbefore, support duct and close opening with steel angles on all sides, secured to both floor and duct. At plenums and risers just above the floor, provide suitable chair assemblies of welded structural shapes.

Where horizontal ducts with standing joints exceed 72 inches in width they shall be provided with additional hangers at the mid-point of their width, consisting of a support bolted to an interior 1/8 x 1-1/2 inch strap that shall, in turn, be bolted to the duct. Internal straps and hangers shall be spaced one for each duct section.

Where trapeze type hangers are used to support exposed ductwork in finished areas, the width of the support shall not exceed the duct width by more than six (6) inches on either side of the duct.

- 7.20. Roof Intake and Relief Hoods: Penn Series Airette, or approved equivalent, aluminum or galvanized steel construction unit with welded joints, complete with aluminum bird screen, hinged hood and 8" minimum height NRCA approved roof curb with built-in cant strip, integral fiberglass insulation and wood nailer. All items furnished shall adhere to roofing manufacturer's requirements so as not to void the roofing warranty. Finish shall be factory baked enamel color to be selected by the Architect.
- 7.21. Coil and Strip Heater Enclosures: Unless otherwise detailed on drawings shall be in accordance with SMACNA "Duct Construction Standards".
- 7.22. Flexible Air Ducts: Flexible duct for connections shall be Thermaflex M-KE, GreenGuard certified, or approved equivalent, air duct rated for a maximum pressure of 16" (4-10 in. ID) or 10" (12-16 in. ID) water column positive and 2" water column maximum negative pressure and 5000 FPM maximum velocity and Listed by Underwriters Laboratories, Inc., under UL Standard 181 as a Class 1 air duct and complying with NFPA Standards 90A and 90B. Duct shall have a maximum flame spread of 25 and a maximum smoke developed rating of 50. Flexible air duct shall be factory made and composed of an inner duct of woven and coated fiberglass providing an air seal and permanently bonded to coated steel wire helix, a fiberglass insulating blanket and low permeability outer vapor barrier of fiberglass reinforced metallized film laminate. R-value shall be a minimum R=8 per ASTM C-518.

Flexible duct length shall not exceed six (6) feet max. Supply each duct with connectors and collars. Suspend ducts over three feet long with 22 ga. 3" wide galvanized metal saddles hung from structure with 24 ga. 1" wide straps. Provide metal clamp/band at take-off fitting and supply fixture connections. Branch duct connectors for connecting round low velocity branches to rectangular low velocity trunks shall be rectangular to round take-off fittings as detailed on the drawings with damper and stand-off mounting bracket. Where diffusers are supplied with vertical air inlets, a metal elbow transition piece shall be provided for connection to the flexible duct.

## PART 8. FUME HOOD EXHAUST DUCTS

- 8.1. General: The HVAC contractor shall provide exhaust air duct for each lab fume hood constructed of 16 gauge type 316 stainless steel and terminate with stackhead as shown on the drawings.

## PART 9. FUME HOOD AIR FLOW ALARM

- 9.1. General: Provide for each hood an alarm system complete with velocity monitor, velocity sensor, visual and audible alarms, LED signals and other auxiliaries required to provide safe hood operation. Note the hood fan is constant volume. The system shall be equal to TSI Fume Hood Monitor, model 8610 ever watch face velocity monitor.

The fume hood face velocity monitor system shall be furnished and installed to monitor the measured face velocity of a fume hood independent of sash position and duct static pressure. The system shall continuously monitor and display face velocity to comply with the recommendation set forth in Appendix A of OSHA regulation 29 CFR 1910.1450. The system shall also indicate the presence of airflow to comply with the NFPA 45 Standard.

## PART 10. DUCT INSULATION WORK (EXTERNAL)

- 10.1. General: All work by experienced applicators in accordance with manufacturer's recommendations. Duct must be clean, dry and pressure tested before covering is applied. Cover flexible connections with insulation material as hereinafter specified to same thickness as adjacent duct. All insulation materials (coatings and mastics) shall be fire resistive per NFPA Pamphlet No. 90, ASTM C 411 and shall be UL listed and shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84, NFPA No. 255 or UL 723.

- 10.2. Material: Provide GreenGuard certified, 2" thickness, 1.0 lb. density glass fiber duct insulation with reinforced foilkraft laminate jacket, formaldehyde-free, Johns-Manville Micro-Lite XG, Type 150 or equal material by Knauf, Schuller, Pittsburgh or CSG.

Thermal conductivity per ASTM C-518, at its rated thickness, shall be not less than  $k=0.25 \text{ BTU}\cdot\text{in}/(\text{hr}\cdot\text{ft}^2\cdot^\circ\text{F})$  at 75 F mean temperature with test based on material thickness compressed 25%.

**NOTE:** For all supply and return air ducts in attic or outside the building insulation envelope provide an additional layer of 2.0" thick layer (4" total). The first layer shall be provided without a vapor barrier. At the contractor's option, one layer of 4"

thickness may be provided in lieu of 2 separate layers.

- 10.3. Ducts to be Insulated Externally: Supply air ducts including ducts with liner, short branch duct collar connections to grilles, registers and diffusers 24" up and downstream of each electric duct heater, all flexible connectors, and exterior rim/cone of all ceiling diffusers.

- 10.4. Application: Sheet metal duct shall be clean, dry and tightly sealed at all joints and seams before applying duct wrap. Adhere insulation to metal with 4" strips of low VOC insulation bonding adhesive at 8" on center on circumferential joints. Wrap insulation tightly on the duct work with all circumferential joints butted and longitudinal joints overlapped a minimum of 2". The 2" flange of the facing shall be secured using 9/16" flare-door staples applied 6" on center and taped as specified hereinafter. On longitudinal joints, the overlap shall be secured using 9/16" flare-door staples applied 6" on center and taped as specified hereinafter. For rectangular ducts wider than 24", additionally support insulation with weld pins and speed clips 18" on center. Fasteners shall be cut off flush after the speed clips are installed and shall be sealed as specified below for circumferential and longitudinal joints.

All circumferential and longitudinal joints and all penetrations or punctures in vapor barrier facing shall be taped with 4" wide pre-sized glass cloth adhered and finished with two (2) coats of a white vapor barrier coating equal to Foster 30-35. **No FSK tape will be allowed.**

#### PART 11. DUCT INSULATION WORK (INTERNAL)

- 11.1. General: Duct liner, mastics and materials shall comply with all requirements and other building code requirements. All insulation materials (coatings and mastics) shall be fire resistive per NFPA Pamphlet No. 90A and 90B and shall be UL listed and shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84. Liner materials shall conform to the performance based ASTM C1071, which includes ASTM C518 Thermal Conductivity, ASTM C411 Temperature Resistance, ASTM C665 Corrosiveness, ASTM E84 Surface Burning Characteristics, ASTM C1338 Fungi Resistance, ASTM C1304 Odor Emissions and ASTM C1104 Moisture Vapor Sorption.
- 11.2. Material: Liner shall be a GreenGuard certified, low VOC, Type I liner as defined by ASTM C1071. It shall have an acrylic coating formulated with an immobilized, EPA registered, protective agent to protect against growth of fungi and bacteria as required by ASTM C1071 and tests conducted in accordance with ASTM G21 and ASTM G 22. It shall not support microbial growth and have glass fibers bonded with a thermosetting resin. The airstream surface shall be protected with a reinforced coating with flexible glass cloth reinforcement. The liner shall have a reinforced, factory applied edge coating and operate in an environment of a maximum of 250°F and maximum of 6,000 fpm air velocity. Thermal conductivity per ASTM C-518, at its rated thickness, shall be not less than  $k=0.24 \text{ BTU}\cdot\text{in}/(\text{hr}\cdot\text{ft}^2\cdot^\circ\text{F})$  at 75 F mean temperature in accordance with ASTM C18 and a minimum  $R=4.2$  for the thickness indicated below. Sound absorption coefficients for the liner shall be per ASTM C 423-90 and ASTM E 795 test methods and the table below. Furnish with the material submittal sound characteristics for approval.

Sound Absorption Coefficient at Frequency

Thickness (Cycles per Second)

(in)	125	250	500	1000	2000	4000	NRC
1	0.08	0.31	0.64	0.84	0.97	1.03	0.70

- 11.3. Manufacturer: Shall be Johns Manville Linacoustic RC or equivalent material by Schuller or Certaineed.
- 11.4. Thickness: 1.0 inches.
- 11.5. Ducts and Equipment to be Insulated: Exposed supply air ducts in areas without ceilings, outside air ducts, return air ducts, return air plenums, transfer air (jumper) ducts, and relief air ducts.
- 11.6. Acoustical Duct Lining: Line the first ten (10) linear feet of supply air ducts downstream of all heat pumps, air handling units, packaged units, etc. Lining material shall be as specified above for duct liner.
- 11.7. Application: Adhere insulation to the entire surface of the sheet metal with fire resistive UL labeled adhesive before the metal is broken. In addition, secure all sheets wider than 25 inches with sheet metal screws and washers or stud pins and clips 16 inches on center, each way. Joints shall be straight and smooth and shall be buttered with adhesive to prevent erosion and improve air flow. All leading and trailing edges shall be secured with sheet metal nosings to protect insulation edges. Damage to the liner shall be repaired using Johns Manville SuperSeal products as required or equivalent materials by other manufacturers with their specific equivalent products.
- 11.8. Metal Nosings: Provide metal nosings on upstream edge of liner at connections to equipment: Fans, coils, dampers, AC units, etc.

## PART 12. REGISTERS, GRILLES AND DIFFUSERS

- 12.1. General: All registers and grilles shall be product of a single manufacturer; shall be constructed of extruded aluminum with baked enamel finish with color as selected by the Architect. Where lay-in type panels and frames are specified, check ceiling suspension system and coordinate interfacing. All grilles, diffusers and registers shall be mounted with aluminum countersunk screws with finish to match respective items. All grilles, registers and diffusers shall be ADC or approved equivalent Agency certified.
- 12.2. Square and Rectangular Neck Ceiling Diffusers: Titus Model TDCA-AA 6-95-125-25 removable core type, extruded aluminum construction, with baked enamel finish color selected by the Architect, designed for one, two, three and four-way diffusion as indicated on plans, complete with AG-95 opposed blade damper, AG-125 Dua-Trol and adjustable vanes. Where lay-in ceiling occurs, diffusers shall have integral 2' x 2' or 2' x 4' aluminum modular lay-in ceiling panel with finish to match diffuser.
- 12.3. Square Ceiling Diffusers with Round Neck: Titus Model TMSA-AA removable core Type, aluminum construction, with baked enamel finish color selected by the Architect, designed for four-way diffusion complete with AG-85 butterfly blade damper. Diffuser face shall be 24" x 24" with type frame to interface with ceiling system. Use lay-in type frame where lay-in ceilings occur.
- 12.4. Wall Supply Air Register: Titus Model 300 FS-5-D-65, all aluminum adjustable table 4-way deflection type. Provide with AG 35B opposed blade damper with worm gear,

Allen Key operators and AG-150 extractors with No. 1 operator, auxiliary mounting frame and baked enamel finish.

- 12.5. Wall Return Air Registers: Titus Model 33RS5-PF gymnasium heavy duty steel register with 45 degree deflection 14 ga. blades, support bars on 6" centers Allen key operated O.B. damper and auxiliary mounting frame all finished with baked enamel finish color to be selected by the Architect.
- 12.6. Ceiling Mounted Exhaust and Return Register: Titus Model 50-F-0-5-D-25, all aluminum fabricated egg-crate type with baked enamel finish color to be selected by the Architect, Allen key operated opposed blade damper and lay-in type frame.  
  
Where lay-in ceilings occur each register shall have integral 2' x 2' or 2' x 4' aluminum modular lay-in ceiling panel with finish to match diffuser.
- 12.7. Ceiling Mounted Return Grilles: Same as return air registers except without dampers.
- 12.8. Door Louvers: Furnished and installed by General Contractor.
- 12.9. Brick Vents for Exhaust Fan Discharge: Extruded aluminum, Reliable #RBV brick and block vent with #4 mesh removable aluminum screen and integral water stop. Finish shall be factory paint color to be selected by the Architect.
- 12.10. Wall Louvers for Fresh Air Intake: Specified (together with screen) under Division 8 of specifications.
- 12.11. Filter Grilles: All aluminum construction, equal to Titus Series 33RF, hinged with 1" thick pleated filters.
- 12.12. Equal Products: By Titus, Price, Kreuger, Tuttle & Bailey, J&J and Metalaire will be accepted.

#### PART 13. CONDENSATE DRAINAGE PIPING

- 13.1. General Workmanship: Cut accurately to measurements established at site and work into place without springing or forcing, properly clearing all building features. Route through previously built-in sleeves and avoid cutting or other weakening of the structure. Ream all pipe to remove burrs. Make changes in direction and size with fittings (no bushings will be allowed).
- 13.2. Condensate Drain Piping: Schedule 40 galvanized steel with galvanized screwed fittings; or type "M" hard copper tubing with wrought copper solder joint fittings. Provide a trap in each drain line with capped or plugged cleanout tees. Trap depth shall be equal to the total system pressure plus one inch.

#### PART 14. REFRIGERANT PIPING AND ACCESSORIES

- 14.1. General: System shall be complete and sized to conform to current ACRMA standards, except that refrigerant suction risers shall be sized for a gas velocity not less than 2000 fpm. Where refrigerant piping is shown rising in the wall cavity and requires modifications to the block wall due to the size of the piping and insulated assembly, the block shall be neatly saw cut. Provide reinforcing to the affected portions of the wall as indicated on the structural drawings and details, the same as required at window and door openings. See the structural drawings for specifics.

**Extreme coordination is required prior to the erection of the structural slab and wall. Coordinate with the General Contractor.**

Also, provide a refrigerant sight glass for each outdoor unit except in refrigerant piping feeding the refrigerant hot gas reheat coils.

- 14.2. Piping: Type L hard drawn copper ACR refrigerant tubing with long radius wrought copper solder joint fittings. Provide wall sleeves, hangers and escutcheons as specified for typical piping. Piping within wall cavities shall be seamless type with no joints. **No precharged refrigerant line sets are allowed.**
- 14.3. Joints: Make up with high temperature silver solder suitable for 300 psi working pressure. Pass dry nitrogen gas through pipe while joints are soldered. No joints shall be allowed within any masonry walls or any other inaccessible area. Solder shall be Sil-Fos 15 or approved equivalent, for R-22 systems. For R-410a and similar non-CFC refrigerants, use Sil-Fos 25 or approved equivalent. All soldering or brazing, materials and methods used, shall be as recommended by the unit manufacturer. Piping within wall cavities and other inaccessible areas shall be seamless type with no joints.
- 14.4. Piping Diagram: Because various manufacturers have different reasons for the use of loops, traps, etc., in piping arrangements, submit for approval dimensioned isometric piping diagram proposed for use, showing all valves, loops, pipe sizes, etc. Secure approval of compressor manufacturer before submitting.
- With diagram for each system, submit catalog data and manufacturer's ratings for all valves, catch-alls moisture and liquid indicator sight glass, etc. Identify all items for respective system and list capacities, pressure drops, etc.
- 14.5. Solenoid Valves: Install in liquid refrigerant connection to the evaporators. Valves shall be designed for the operating pressure and capacity as listed in manufacturer's catalog with a pressure drop not exceeding 2 psi, and shall be sufficient for the requirements of the installation. Install in horizontal runs with body vertical.
- 14.6. Expansion Valves: Properly sized diaphragm or bellows type, with external superheat adjustment set for 10 degrees F. superheat, complete with a liquid sight glass with moisture indicator. Install in the liquid refrigerant supply lines to the evaporators.
- Expansion valves up to and including 7-1/2 tons capacity shall be Sporlan Type "S", or approved equivalent. Expansion valves over 7-1/2 ton capacity shall be Sporlan Type "O" or approved equivalent. Install Sporlan full size catch-all filter-drier ahead of valve.
- 14.7. Service Valves: Provide where indicated on plans and/or required for the proper servicing of the equipment. Install refrigerant valves in the suction and discharge lines adjacent to the compressor unless built-in double seated valves are furnished. The refrigerant valves shall be designed for the refrigerant used, and have seal caps.
- 14.8. Refrigerant Filter Drier (Catch-all): Install in refrigerant line on the inlet side of each thermostatic expansion valve a Sporlan, three desiccants type filter drier. Filter driers up to and including 10 ton capacity shall be sealed type. Filter driers over 10 ton capacity shall be replaceable core type. Units shall have minimum surface filtering area and capacity not less than that shown in Sporlan Valve Company Bulletin 40 10 under sizes for "field replacement or field built up sizes". Careful attention must be given to providing the correct type of filter drier as it pertains to type of refrigerant (R-22, R-410 or any other non-CFC refrigerant).

## PART 15. PIPE HANGERS AND SUPPORTS

- 15.1. General: Refer to Section 15010.

## PART 16. PIPE AND MISCELLANEOUS INSULATION WORK

- 16.1. General Provisions: All work by experienced insulation subcontractor in accordance with manufacturer's recommendations. Piping must be clean, dry and pressure tested before covering is applied. Size pipe hangers to fit insulated pipe size. See hangers and supports. Cover fittings, valves and flanges with insulation material as hereinafter specified to same thickness as adjacent pipe covering except screwed unions in hot piping and other specifically named items. Neatly bevel covering edges adjacent to unions and other points of termination. All insulation materials including coatings and mastics shall have a composite rating for insulation, jacket or facing including adhesives shall have hazard rating not to exceed 25 flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E-84, NFPA 255 and UL 723.

- 16.2. Refrigerant Suction Lines and Hot Gas Reheat Coils Hot Gas and Liquid Lines: Insulate with UL fire and smoke rated nominal  $\frac{3}{4}$ " thick flexible foamed plastic, closed cell pipe insulation equal to Rubatex R-180-FS. **Longitudinal cutting of the insulation is prohibited.** Slip onto pipe prior to erecting. Insulation shall have a 'k' factor of not more than 0.26 at 70°F mean temperature and a water vapor transmission rate of 0.1 perm-inch or less. Seal butt joints with #373 adhesive.

Insulate sweat fittings with miter-cut pieces of insulation the same size as on adjacent piping. Insulate screwed fittings with sleeved fitting covers fabricated from miter cut pieces of insulation according to the manufacturer's sleeving size recommendations, overlap and seal to the adjacent pipe insulation.

Paint all exterior insulation and insulation in mechanical rooms (not in the attic) with two coats of Rubatex 374 black finish.

- 16.3. Condensate Drain Lines: Same as refrigerant suction lines except  $\frac{1}{2}$ " thickness.

## PART 17. HEAVY DUTY MODULAR AIR HANDLING UNITS

- 17.1. General: Central station, double wall construction air handling units of the type, of size and capacity as schedule. Unit fan and coil performance shall be certified in accordance with ARI Standard 430-89 for fans and 410-87 for coils. Installation shall be in strict accordance with manufacturer's recommendations. Air handling units shall be AMCA certified for total static indicated on the drawing plus 1.5".

- 17.2. Unit Casing and Fan Sections: Modular unit components shall be constructed of double wall sectionalized heavy-gauged mil galvanized steel formed panels, rigidly reinforced with structural framing members. Casing panels shall be removable for easy access to the unit. Units shall be double wall constructed in all sections. Exterior wall shall be minimum 18 gauge galvanized steel. Interior wall shall be minimum 20 gauge solid plate, galvanized steel. All portions of the interior of the unit exposed to the airstream shall be covered with galvanized steel to allow cleaning and prevent fiberglass erosion into the airstream.

Coil and fan section casing including panels shall be insulated with minimum two-inch

thick 1.5 lb. density neoprene coated glass fiber insulation. Insulation shall be secured to the casing with waterproof adhesive and permanent fasteners. All joints, edges and seams shall be coated with approved mastic. Casing insulation shall meet NFPA-90A flame spread and smoke generation requirements.

**NOTE:** Provide additional insulation as required to prevent condensation at project ambient and unit conditions.

Provide access doors for access to all sections. Access doors shall provide access to both entering and leaving side of all coils. Doors shall provide access to enter and clean each coil, and access to fan and drive. These doors are to be a minimum of 20 inches wide by full casing height, galvanized, double wall, hinged, removable access doors. Access door shall have a full perimeter automotive type gasket to prevent air leakage, and ventlock style, exterior handle that can be opened from unit interior.

The condensate drain pan shall have double wall construction with 16 gauge 304 stainless steel interior pan, threaded drain connections, and shall extend under the complete fan and coil section. It shall be insulated with 0.6 inch thick plastic foam faced with an additional aluminum foil vapor barrier and cemented between the steel outer pans and the heavy gauge steel inner pan. Insulation, adhesive and inner coating to comply with NFPA-90A flame spread and smoke generation requirements. Drain pan to be IAQ, indoor air quality, type sloped such that no condensate will stand in the pan.

- 17.3. Coil Sections: Shall have heavy-duty coil tracks extending the full width of the unit to permit removal of coils for ease of service and maintenance. Where cooling coils are stacked, they are to have intermediate drain pans with drip tubes at either end to drain condensate to the main drain without flooding the lower coil.

DX. coils shall have continuous plate-fin surface with seamless copper tubes expanded into aluminum fins. Maximum fins per inch shall be 12. Casings shall be 16-gauge stainless steel. Capacities, pressure drops and selection procedure shall be certified in accordance with ARI Standard 410-87. Each coil shall be leak tested before shipment at 300 PSIG, and be suitable for working pressures and temperature to 250 PSIG and 220 degrees F. Furnish for approval capacity and balance curves for all units. Coils shall be constructed of copper tubes. Provide factory installed drain and vent connections extending through unit casing for all water coils. Provide minimum 12 inch space between coils for mounting of control sensors. Provide access door to this space a minimum of 8 inches wide by full casing height.

- 17.4. Hot Gas Reheat Coil: Each unit shall be provided with a refrigerant hot gas heating coil in the reheat position for humidity control. Provide, complete, with all necessary valves, controls, etc., as required for a complete and properly functioning installation. Provide manual isolation valves, located in the mechanical room, for each hot gas and liquid lines. Furnish for approval equipment manufacturer approved refrigerant piping and controls diagram. **Equipment submittal will not be reviewed without a manufacturer's approved diagram.** Minimum reheat capacity for supply air shall be 15°F.

- 17.5. Fan Sections: Constructed of heavy galvanized steel, and formed channel base for integral mounting of fan, motor and casing panels. Fan scroll and bearings are to be mounted on an "A" or "HI" frame structure rigidly secured to the channel base. Motor shall be factory installed on slide rails having 2 adjusting screws. For units with internally mounted motors access to the motor and drive is to be provided by access door located on the drive side of the unit and of adequate size to permit removal of the fan wheel, motor and drive.



Bearings shall be self-aligning 1200,000 pillow block regreasable ball types selected for an AFBMA-B10 average life of 200,000 hours at design operation conditions. Bearing shall be provided with external grease line extending to front of the unit. Shafts shall be solid steel, turned, ground and polished.

Fan wheels shall be keyed to the shaft and shall be designed for continuous operation at the maximum rated fan speed and motor horsepower. Fans and shafts shall be selected to operate at least 25% below the first critical speed. Fan wheels and shafts shall be statically and dynamically balanced as an assembly. After final assembly, the entire unit is to be given final vibration test at factory.

Fan performance curves and fan sound power analysis for each octave band shall be included with submittal, rated at system design points. Fans shall not pass through their first critical speed at any cataloged RPM.

Fans shall be air foil double width, double inlet type with backward included blades. Wheels shall be painted with a zinc-chromate primer and an enamel finish coat. Fans shall be internally isolated.

- 17.6. Motors and Drives: Motors shall be high efficiency open drop proof built to NEMA Standards for continuous use. Motors shall also be provided with phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling. Drive package shall be variable pitch and shall be selected with a service factor of 1.5 based on motor horsepower. Refer to Paragraph 2.2. Motors.

- 17.7. Filters: Filter shall be 4-inch throwaway type equal to Farr Series Riga-Flo-XL. Filter media shall be of the non-woven synthetic fabric type and shall be reinforced by a woven scrim backing.

The filter media shall have an average efficiency of 40-45% on ASHRAE Test Standard 52-79. It shall have an average arrestance of not less than 96% in accordance with that test standard. The filter shall be listed by Underwriters Laboratories as Class 2.

Maximum Filter Face Velocity – 500 FPM

The Unit manufacturer shall furnish a filter box as shown on the drawings. Contractor shall provide filters during guarantee period as specified hereinbefore. Provide for each unit one Dwyer No. 2002 magnahelic gauge, or equal complete with probes and tubing.

- 17.8. Isolators: Provide internal factory isolation. See paragraph "Vibration and Noise Control" for isolation requirements.
- 17.9. Acceptable Manufacturers: Trane Series "Climate Changer Special" or approved equivalent by Carrier or York.

## PART 18. VENTILATION

- 18.1. General: Provide all fans complete with ducts, grilles and accessories. Roof fans and curbs shall be painted with two coats of non-reflective paint. Paint type and color as directed by architect. All roof curbs, etc., furnished shall adhere to roofing manufacturer's requirements so as not to void the roofing warranty. All fans shall be

AMCA certified in accordance with Standards #210 and 300. Furnish for approval capacity and sound power ratings. All motors ½ HP and smaller shall have built-in overload protection. All motors shall also be provided with phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling.

For belt driven units provide adjustable v-belt drives sized for 50% overload and adjustable motor base.

- 18.2. Roof Centrifugal Exhaust Fans: Fans shall be centrifugal power roof ventilators with AMCA certified air and sound ratings. Fans shall be belt or direct driven as shown and shall have permanently lubricated and sealed flanged bearings rated for 200,000 hour average life. All aluminum wheels statically and dynamically balanced backward curved blade wheels and spun aluminum housing with curb cap, disconnect switches, backdraft damper and outlet bird screen. For belt driven fans provide v-belt drive size for 50% overload, adjustable pitch cast iron sleeves for motor and fan adjustable motor blade. For each fan furnish an 18 gauge galvanized steel insulated prefabricated curb with integral cant and continuous welded joints. All curbs, etc., furnished shall adhere to roofing manufacturer's requirements so as not to void the roofing warranty.

Fans shall be equal to Cook Series "ACE".

Motors ½ HP and smaller shall have built in overload protection. The top of all roof curbs shall be level with pitch built into curb when deck slopes 3/8 of an inch per foot or more, check architectural and structural plans for pitch. Coordinate roof curb and interface in the building roofing system.

- 18.3. Ceiling Mounted Cabinet Fans: Penn Ventilator Company Series Zephyr, or approved equivalent, complete with all accessories, including unit mounted, solid state speed control switch, ceiling grille, direct driven centrifugal fan, backdraft damper and terminal cap, cast aluminum brick vent or soffit grille as shown on the plans. Fan shall be supported from the structure. Do not allow full weight of fan to be carried by the ceiling grid. Mount fan in 24" x 24" lay-in metal ceiling panel not in the acoustical ceiling tile.
- 18.4. Utility Sets: Barry Type "R" Versacon BI heavy duty steel housed, belt-driven centrifugal blower type utility sets, with minimum capacities and characteristics as shown. The units shall bear the AMCA certified rating seal. Fan wheels shall be of the backward inclined curve type. Units shall have adjustable motor bases, grease lubricated pillow block bearings for 200,000 hours, standard NEMA design open drip proof motors, v-belt drive with variable pitch pulleys, weatherproof housings for motors, and drives, automatic discharge shutters, and Cellon treated timber supports. Provide flexible connectors for all duct connections to fans (waterproof type). The entire interior of all units shall be coated with Hersite or 4 mil of polyvinyl plastic coating.

- 18.5. Acceptable Manufacturers: Cook, Acme, Greenheck, Penn, Barry, Bayley, Peerless.

## PART 19. ELECTRIC DUCT HEATERS

- 19.1. General: Shall be open grid, flanged type, by Branch Manufacturing or approved equivalent by Chromalox or Indeeco. The coil with all components built in at the factory shall carry the UL label. Each coil will have double thermal protection, consisting of a thermal overload Klixon device and heat limiters in the power legs. If

back up contactors are used as secondary thermal overload protection in lieu of the fused elements, these contactors shall be built-in and prewired at the factory. Each heater shall be factory wired for single power connection.

The heater coil shall be provided with SCR control for maximum efficiency and use of the heater. All coils will be factory fused and pre-wired as required to meet the latest National Electric Code. Each coil terminal box will be factory insulated to prevent condensation.

Resistance wire used in each coil shall be 80% nickel and 20% chromium with no iron content. Wire shall be supported by ceramic bushings, mounted in a galvanized steel frame on not more than 4" centers.

- 19.2. Accessories: Control box with factory built-in transformers; un-fused safety disconnect; factory mounted, pre-wired, pressure-type air flow switch field adjustable from 0.07" to 5.0" WG pressure-type air flow switch. Under no circumstances will a sail switch be used.
- 19.3. Installation: Complete installation shall comply with the manufacturers' installation instructions, UL listing requirements, NEC and local codes. Locate and arrange for easy access and service.
- 19.4. Acceptable Manufacturers: Brasch, Indeeco, Chromalox or Electric Heaters, Inc.

## PART 20. SPLIT SYSTEM HEAT PUMP UNITS

- 20.1. General: Furnish and install split system heat pump systems as manufactured by the Trane Company, or approved equivalent by Carrier, York or Lennox. Each unit shall be completely factory assembled and tested, and shall include hermetic compressor, outdoor (condenser) coil, fan and motors, interconnecting wiring, low voltage control transformer, prewired control panel and other necessary components mounted in weather resistant steel cabinet with baked on enamel finish. The unit shall be UL or ARL (Applied Research Labs) listed and labeled accordingly. The heat pump shall be sound rated per ARI Standard 270 and operation sound level shall not exceed acceptable limits. Heating and cooling capacities shall be not less than those indicated on the drawings. Indoor and outdoor units shall also be provided with phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling..
- 20.2. Special Considerations: The equipment manufacturer shall size the refrigerant piping for all the units and shall furnish all accessories and auxiliaries required for a satisfactory installation. All units shall have a minimum EER and COP specified and required to meet and comply with State Codes.
- 20.3. Cabinet: Heavy gauge galvanized steel cabinet with weather resistant baked enamel finish. Access to the electrical controls and compressor shall be made by removing two service panels.
- 20.4. Compressor System: The unit shall contain a hermetic compressor. The compressor shall have high and low pressure protection, sump heat and compressor overload protection. Refrigerant circuit shall include service valves and pressure tap ports, check valves, switch over valve, refrigerant line filter-driers and factory furnished holding charge of R=22. Compressor shall be designed, manufactured and warranted for five years by the air conditioning unit manufacturer.

- 20.5. Outdoor Coil: The outdoor coils shall be constructed of aluminum fins or Spine Fin mechanically bonded to seamless aluminum or copper tube and shall be protected by a unit manufacturer furnished, heavy-duty metal guard. The outdoor coil shall have expansion valve refrigerant control during heating operation, and automatic time and temperature actuated defrost control system. Unit shall, as factory shipped, cycle fan motor on outdoor thermostat for low ambient cooling down to 40°F outdoor temperature. Provide PVC coated expanded metal coil guard.
- 20.6. Controls: Controls shall be factory wired and readily accessible. Compressor shall have overload protection, high and low pressure cutouts, 24-volt control transformer and magnetic contactor.
- 20.7. Air Handler: Air handler cabinet shall be constructed of heavy gauge steel with baked enamel finish and be internally lined with foil laced fiberglass insulation. The indoor coil shall be constructed of aluminum plate fins mechanically bonded to seamless copper tubes. The indoor (evaporator) coil shall have expansion valve control and be equipped with defrost control. Indoor blower shall be of the centrifugal type, forward curved and shall be driven by a direct drive, or a belt drive motor with variable pitch pulley and permanently lubricated ballbearing motor. Air handler shall be provided with low voltage terminal board and fan motor relay. Refer to drawings for specific drive requirements.
- 20.8. Electric Heaters: Provide electric heater with a total heating output not less than indicated on the drawings. Heater assembly shall include power supply fusing, automatic resetting limit switches and heat limiters for thermal protection. Heater shall be provided with factory disconnect switch and fusing all per National Electrical Code and UL.
- 20.9. Hot Gas Reheat Coil: Each unit with scheduled cooling capacity greater than or equal to 40 MBH shall be provided with a refrigerant hot gas heating coil in the reheat position for humidity control. Provide, complete, with all necessary valves, controls, etc., as required for a complete and properly functioning installation. Provide manual isolation valves, located in the mechanical room, for each hot gas and liquid lines. Furnish for approval equipment manufacturer approved refrigerant piping and controls diagram. **Equipment submittal will not be reviewed without a manufacturer's approved diagram.** Minimum reheat capacity for supply air shall be 15°F.
- 20.10. Indoor Thermostat: See Automatic Controls. Heat pump thermostat shall have outdoor thermistor to compensate for thermostat droop, emergency heat switch with indicator light and auxiliary heat light. Provide hinged metal guard with rounded corners, lock and key for each thermostat. Thermostat shall have sub-base fan switch for "On-Auto" selection and manual "Summer-Winter" switch.
- 20.11. Outdoor Thermostat: Provide mounting box. Provide one outdoor thermostat for control of second stage of electrical heaters.
- 20.12. Factory Start-up Service: The Contractor shall provide for a factory-trained mechanic, employed by the unit manufacturer and not a sales representative, to check out all equipment and furnish written report indicating equipment is installed in strict accordance with manufacturer's recommendations. Also, provide temperature, pressure and amp readings taken during testing to substantiate unit performance
- 20.13. Power Wiring: Unit shall be factory wired for power supply indicated on the electrical drawings. Any variation will be the responsibility of the contractor.

- 20.14. Filter Frame and Filters: Provide 1" thick pleated filters equal to 30/30/ Farr Series. Where indoor section sits on R.A. platform or is horizontally mounted in an attic space and the manufacturer does not provide a filter access with thumbscrew access in the bottom of the unit, provide a filter frame that is designed to mount to the bottom (R.A. inlet) of the air unit. Frame shall be hinged and have thumbscrews or wingnuts to open the access door. Filter frame shall be as manufactured by E-Z Filter Base Mfg., Inc. or approved equivalent.

## PART 21. ROOF MOUNTED PACKAGED OUTDOOR HEAT PUMP UNITS

- 21.1. General Description: One piece combination air-to-air heat pump units designed for bottom handling of conditioned air, complete with automatic controls, GFI convenience power outlet and phase protection across all legs. The equipment shall be shipped completely assembled, pre-charged, piped and wired internally ready for field connections. The manufacturer shall test operate the unit before shipment. Units shall have PVC coated, expanded metal condenser coil guard.
- 21.2. Economizer Package: Provide complete with all controls, air mixing damper assembly consisting of an enthalpy controller, fresh air, recirculated air and exhaust air dampers. The fresh air section shall be equipped with 1" thick disposable air filters. The assembly shall mount within the confine of the unit casing. The system shall be interlocked so that when room thermostat calls for cooling or heating the outside air dampers will return to minimum position.
- 21.3. Cooling System: Total certified cooling capacity not less than indicated in the Equipment Schedule. Coils shall be of non-ferrous construction with aluminum fins mechanically bonded to seamless copper tubes. Condenser coils shall have sub-cooling rows. The compressors shall be resiliently mounted; have built-in 3-mode crankshaft lubrication, crankcase heater, discharge temperature limiter, current and temperature sensing motor overloads, and five year guarantee. The system shall be protected by high and low pressure switches, a five minute compressor timed off cycle controller, freezestat, and head pressure controls, reversing valves, accumulator, defrost control system, etc. as required for a complete installation. Units over 7.5 tons capacity shall have capacity reduction controls. Compressors over 10-ton capacity shall have oil failure switches.
- 21.4. Hot Gas Reheat Coil: Each unit with scheduled cooling capacity greater than or equal to 40 MBH shall be provided with a refrigerant hot gas heating coil in the reheat position for humidity control. Provide, complete, with all necessary valves, controls, etc., as required for a complete and properly functioning installation. Provide manual isolation valves, located in the mechanical room, for each hot gas and liquid lines. Furnish for approval equipment manufacturer approved refrigerant piping and controls diagram. **Equipment submittal will not be reviewed without a manufacturer's approved diagram.** Minimum reheat capacity for supply air shall be 15°F.
- 21.5. Auxiliary Electric Heating System: The electric heater with all components built in at the factory shall carry the UL label. Each coil will have double thermal protection, consisting of a thermal overload Klaxon device and heat limiters in the power legs, current sensing relay, transformer, and timer delay relay. Provide primary fusing, branch circuit fusing per UL and NEC requirements. If backup contactors are used as secondary thermal overload protection in lieu of the fused elements, these contactors shall be built in and prewired at the factory. Resistance wire used in each coil shall be 80% nickel and 20% chromium with no iron content. Wire shall be supported by ceramic bushings, mounted in galvanized steel frame on not more than 4" centers.

The entire unit shall be factory wired for single power connections as shown on the Electrical Drawings.

- 21.6. Fans: Conditioned air blowers shall be twin centrifugal type with permanently lubricated ball bearings, adjustable belt drivers, and CFM capacity as indicated. Condenser fans shall be direct driven. All motors shall have inherent protection devices on all legs.
- 21.7. Frame and Casings: The frame shall be of welded construction. The casing shall be of galvanized panels with a baked on outdoor acrylic finish. The cabinet bottom shall be insulated with Styrofoam; cabinet panels shall be insulated with 1" fiberglass. All components, wiring and inspection areas shall be completely accessible through removable panels with locking door handles. Unit shall be provided with a unit manufacturer furnished, heavy-duty expanded metal condenser coil guard.
- 21.8. Filters: Provide 2" thick pleated disposable type filters for each filter location, equal to Farr Series 30/30.
- 21.9. Factory Start-up Service: See Automatic Controls.
- 21.10. Temperature Controls: Control for each system shall consist of a low voltage combination heating and cooling, with sub-base equipped with "Heat" "Cool" and "Off" switch and fan "on" and "auto" switch. Also provide an adjustable outdoor thermostat to control the second stage of the electric heaters through this thermostat. Provide hinged metal guard with rounded corners, lock and key for each thermostat.
- 21.11. Acceptable Manufacturers: Carrier, Trane, York or Lennox.

## PART 22. AIR COOLED CONDENSING UNITS

- 22.1. General: Units shall be ARI rated, remote air-cooled, fully weatherproof, of capacity not less than shown at specified operating conditions. Refer to General paragraphs of this Section for warranty requirements. All units shall be provided with phase protection.
- 22.2. Acceptable Manufacturers: Carrier, York, or Trane.
- 22.3. Condenser Coil: Tubes shall be of copper (aluminum for capacities under 7.5 tons) with mechanically bonded aluminum plate fins, protected by a unit manufacturer furnished, PVC coated, heavy-duty expanded metal guard.
- 22.4. Condenser Fan and Motor: Direct or belt driven, propeller type fan arranged for vertical discharge. Fan motor shall be of the permanently lubricated type, resilient mounted, with a cadmium plated 1/2" mesh wire safety guard removable for service; provide with current characteristics as shown.
- 22.5. Compressor: Hermetic type with suction and discharge service valves, oil crankcase heater, suction strainer, oil strainer, oil sight glass, and oil charging connection. Compressors shall have a force feed lubrication system with reversible oil pump and operating oil charge. Compressor motors shall be refrigerant gas cooled, high torque, hermetic induction type, with inherent thermal protection in all three phases.

Units with more than one compressor shall have complete separate refrigerant circuits to the evaporator. Compressors over 10-ton capacity shall be accessible

hermetic type with oil failure switches, and automatic capacity reduction controls activated by suction pressure.

- 22.6. Casing: Of galvanized steel, bonderized, and furnished with baked enamel or an equivalent corrosion-resistant surface. Opening shall be provided for power and refrigerant connections. Panels shall be removable to provide access for servicing. The compressor and control box shall be located in a compartment other than that which contains the condenser coil.
- 22.7. Controls: Field power connection, control interlock terminals and unit control system shall be centrally located in a weatherproof enclosure. Power and starting components shall include individual factory fusing of each compressor and condenser fan motor, separate fusing for the control circuit, starting contactors including individual contactors for each fan motor, solid state compressor sequence start timers, solid state overload protection in all three phases for compressor and condenser fan motors, and unit power terminal block for field connection to a single remote disconnect switch.

Safety and operating controls shall include unit emergency stop switch, manual pumpdown switch, oil pressure control, high and low pressure switches, and fan cycling controls. Terminals shall be provided for field connection of 115-volt power supply to the control circuit. Where pump down controls are specified, unit controls shall provide recycling pumpdown protection at all times, including time clock system shutdowns on nights and weekends.

Units shall be provided with automatic head pressure control to permit satisfactory operation at ambient air temperatures down to 40° F. Unit wiring shall incorporate a positive-acting circuit with transformer which shall prevent the compressor from restarting for a five minute period if the power flow is interrupted to prohibit short cycling.

- 22.8. Refrigerant Piping Accessories: The unit shall be equipped with suction and discharge stop valves, discharge gas muffler, ASME Code designed liquid receiver (unless otherwise recommended by manufacturer), safety relief and charging valves, discharge tubing with flexible connection.
- 22.9. Foundations: Provide 6" x 6" Cellon treated timbers. Pitch pans are specified in Division 7. Coordinate all requirements with roofing contractor and provide as recommended so as not to void roofing warranty. Concrete pad is specified under Division 2.
- 22.1. Factory Start-up Service: The Contractor shall provide for a factory-trained mechanic, employed by the unit manufacturer and not a sales representative, to check out all equipment and furnish written report indicating equipment is installed in strict accordance with manufacturer's recommendations. Also, provide temperature, pressure and amp readings taken during testing to substantiate unit performance
- 22.2. Refrigerant: Equipment shall be designed for use with non-HCFC refrigerant. R-407 or other EPA approved refrigerant will be considered.

## PART 23. CONSOLE-TYPE SPLIT HEAT PUMP SYSTEM DUCTLESS UNIT

- 23.1. General: Provide ductless, wall mounted split, ductless type heat pump unit, equal to Mitsubishi Electric "Mr. Slim" Series "PKH" complete with all accessories including wall hung evaporator blower unit, pad mounted outdoor condensing unit, filter frame,

auxiliary heat and filter, remote wall mounted microprocessor electronic thermostat and control module, adjustable discharge louvers, low ambient indoor coil thermistor, auto valve control remote control display (LCD), outdoor microprocessor control and other accessories required for a complete functional installation. Units shall be provided with phase protection.

- 23.2. Refrigerant Piping: Provide copper refrigerant piping system complete with all accessories. Provide insulation as specified hereinbefore.

## PART 24. WALL MOUNTED INDOOR HEAT PUMP UNITS

- 24.1. General: Furnish and install a self-contained, indoor wall mounted air to air heat pump as manufactured by Bard Series "CH" or Marvair Series Scholar III or approved equivalent by Bard. The heat pump shall be completely factory assembled and tested and shall include a compressor, indoor and outdoor coils, fans and motor, interconnecting refrigerant tubing, wiring and factory installed disconnect switch located in a key lock panel, mounted in a corrosion resistant cabinet. Units shall be provided with phase protection. When mounting equipment to the wall, do NOT use drive pins. Use a screwed anchor type device so that the unit may be easily removed for service, replacement, etc. Prior to mounting the unit, the contractor shall apply bead mastic or silicon caulk to the flange of the unit and immediately set the unit in place. This will provide a tight seal between the unit flange and the exterior wall at the time of setting the unit in place. The unit shall be UL Listed for Safety and Certified by ARL.
- 24.2. Cooling Capacity: Total net cooling capacity of the unit shall be as scheduled on plans.
- 24.3. Heating Capacity: Heating capacity shall be as scheduled on plans.
- 24.4. Humidity Control: Hot gas reheat control shall be provided for dehumidification of the space. A hot gas reheat coil, refrigerant specialties and humidistat shall be provided by the unit manufacturer and integrated to the unit control system and factory wired for dehumidification. Provide a heavy-duty type humidistat to control space humidity.
- 24.5. Supplemental Electric Heat: Factory installed electric supplementary heaters shall have a total output as indicated on schedule.
- 24.6. Cabinet: The exterior cabinet shall be constructed of 16 gauge zinc-coated, galvanized steel, G90, painted with polyurethane enamel. The interior cabinet shall be insulated with 1-1/2" glass fibers bonded with thermosetting resin. All exterior fasteners shall be tamper resistant, torque head type. Cabinet shall have a free blow supply plenum with a front supply grille and two (2) side supply grilles.
- 24.7. Acoustical Sound Panel: A factory installed acoustical sound panel shall be provided in front of the unit to block radiated noise from the compressor, condenser fan and return air intake.
- 24.8. Refrigerant Circuit: The compressor shall be a hermetic type and shall be equipped with an immersion type, self-regulating crankcase heater. The refrigeration circuit shall contain an expansion valve, suction line accumulator, liquid filter dryer and suction and liquid access valves. The refrigeration circuit shall include a high pressure switch. The compressor shall be protected against loss of refrigerant charge by a manual reset device. The compressor motor shall be protected by an internal line break thermostat. The compressor shall be a scroll compressor and



isolated from the cabinet by rubber-in-shear isolators. A Time Delay shall be provided to protect compressor from short-circuiting. The unit manufacturer shall provide heavy-duty humidistat and wire to provide for dehumidification with hot gas reheat.

- 24.9. Condenser Coil: The outdoor coil shall be constructed of aluminum plate fins mechanically bonded to seamless copper tubes. Outdoor fan shall be a belt driven, centrifugal, forward curved blower. The outside air intake shall be a minimum of 33" off the ground. The outdoor motor shall be equipped with a thermal protector. Provide an outdoor louvered grille with a 2" flange collar.
- 24.10. Evaporator Coil: The indoor coil shall be constructed of aluminum fins mechanically bonded to seamless copper tubes. Two direct driven indoor blowers shall be of centrifugal equipped with thermal protector. Condensate drain pans must be sloped. Condensate drain lines shall have an internal trap.
- 24.11. Grilles: The unit manufacturer shall provide adjustable supply grille and a hinged return air filter grille with a filter frame and 1" thick pleated filter. The hinged return air grille shall be provided with thumbscrews and pivot downward.
- 24.12. Controls: Manufacturer shall provide a heat pump thermostat with manual 7-day programmable "Summer-Winter" changeover thermostat with fan "On-Auto" switches.. An EMS control relay (24v, 120 or 240 VAC) shall be provided to control the unit operation from a time clock. Also, provide dehumidification controls as specified hereinbefore. Provide hinged metal guard with rounded corners, lock and key for each thermostat
- 24.13. Control Circuit: The internal control circuit shall consist of a current limiting type transformer to generate 24 VAC, switching devices to operate the compressor, indoor fan motor and electrical heater(s). A Field Selectable "S" Circuit shall be provided which disables simultaneous operation of strip heat and compressor. A Field Selectable "Strip On Defrost" activates strip heat during defrost cycle. Provide a factory installed outdoor thermostat that prevents second stage heat above an outdoor air temperature of 40 degrees F.
- 24.14. Motorized Damper Assembly: A motorized outside air damper shall be provided to supply up to 35% outside air. The unit manufacturer shall provide barometric relief damper.
- 24.15. Warranty: Provide Five (5) Year Parts and Compressor Warranty on the complete unit.

## PART 25. AUTOMATIC CONTROLS

- 25.1. General: Furnish and install a complete system of automatic temperature controls, as specified herein, as shown on the Drawings and as required for a complete installation. All temperature control equipment shall be of the electric type.
- 25.2. Submittals: The temperature control contractor shall submit 5 copies of complete temperature control diagrams with written "sequence of operation" and factory-printed specification data sheets covering each control device proposed to be used for Engineer's approval prior to installation of any equipment or part of system. Submittal data shall include a schedule of all devices to be installed.

- 25.3. Installation: All work shall be done by a control sub-contractor.

All wiring incidental to the control system not shown on the Electrical Drawings or specified in Division 16 shall be provided and installed by the Control Contractor including all interlock control wiring between the various components of the air conditioning system, and all smoke detection system electrical wiring. All wiring shall be in accordance with the National Electrical Code, and all State and local codes. All control wiring shall be installed in conduit.

Provide permanent nameplates for all control components and for all motor starters. Nameplates shall be engraved laminated plastic with letters sufficiently large to be legible under normal operating conditions.

- 25.4. Indoor Thermostats: Provide a 7-day programmable combination two-stage heating manual changeover heat pump thermostat. Thermostat shall have outdoor thermistor to compensate for thermostat droop, emergency heat switch with indicator light and auxiliary heat light. Thermostat shall have subbase fan switch for "On-Auto" selection and manual "Summer-Winter" switch.
- 25.5. Humidistats: Heavy-duty commercial type.
- 25.6. Smoke Detectors: Operating on the ionization principles shall be furnished by the Electrical Contractor and installed in the supply air duct near each unit and in the return air duct (prior to mixing with outside air) by the Mechanical Subcontractor. Wire the detectors to stop the unit upon smoke detection. Provide required relays, wiring, etc. Coordinate work with Electrical Sub-Contractor.
- 25.7. Motorized Dampers: Equal to Ruskin Series CD-40 with heavy duty Belimo actuator. Provide weatherproof construction for outdoor installation.
- 25.8. Service and Guarantee: After completion of the installation, adjust all control equipment and place the complete system in operation subject to the approval of the Engineer. Guarantee the control system to be free of defects and adequate to provide required control functions for a period of one year after acceptance of project. Provide free service and maintenance during the guarantee period.
- 25.9. Exhaust Fan Controls: Where indicated provide room thermostats to control the respective fan and intake damper operation to maintain space temperature.
- 25.10. Space Thermostats: Space thermostats shall be 7-day microprocessor programmable, low voltage with "Summer-Winter" and fan ON-OFF-AUTO switches sub-base. Each thermostat shall have building power supply with transformer and battery back-up power. Provide hinged metal guard with rounded corners, lock and key for each thermostat.

Provide a space humidistat to override the cooling thermostat to provide for dehumidification. During dehumidification the space thermostat shall modulate the refrigerant hot gas reheat coil valve (energize the auxiliary heater) as required to maintain space temperature.

- 25.11. Sequence of Operation: Packaged and Split System Heat Pumps, the 7-day programmable thermostat shall energize the control circuit for the respective unit.

Unit manufacturer furnished 7-day microprocessor, programmable thermostat with "Summer-Winter" and fan switches sub-base will be used to control heating and

cooling. On unit start-up the outside air damper shall open. Provide smoke detector interlocks to stop the unit upon smoke detection per NFPA 90A requirements. Provide a space humidistat to override the cooling thermostat to provide for dehumidification. During dehumidification a space thermostat shall modulate the refrigerant hot gas reheat coil valve as required to maintain space temperature. Second of electric heat shall be controlled through an outdoor thermostat set on 40°F.

Provide hinged metal guard with rounded corners, lock and key for each thermostat and humidistat. Provide building power supply to each thermostat with transformer. Each thermostat shall be provided with battery standby power.

Second stage of auxiliary heat shall be energized through an adjustable outdoor thermostat.

- 25.12. Air Handling Unit: Basic controls same as heat pumps. Provide an air pressure switch in the supply air duct and interlock to provide static discharge air pressure prior to starting the condensing unit. This control is required in addition to pressure switch in the duct heater.
- 25.13. Packaged Wall Mounted Indoor Heat Pump Units: Same as packaged heat pump units except smoke detectors not required for these units.

## PART 26. THRU-THE-WALL HEAT PUMP UNITS

- 26.1. Furnish and install where shown on the Drawings packaged through-the-wall heat pump units, GE Series "Zoneline" III, dry air TPI Corporation Series, Zoneair, Trane or approved equivalent.

Each unit shall be complete with cabinet, louvered architectural type aluminum outside grille with flange, unit mounted thermostat, manual fresh air damper, cooling chassis, defrost control, change-over valves, electric heat, filter, adjustable discharge grille and other accessories required for a complete installation. Provide condensate and defrost drain system complete with required piping to drain. Coordinate required wall sleeve depth with the Architectural drawings prior to ordering equipment.

The refrigeration circuit shall be guaranteed by the manufacturer for a period of five (5) years from date of acceptance of project.

Unit manufacturer shall furnish cord with plug and receptacle.

END OF SECTION

SECTION 16000 - ELECTRICAL

PART 1 - ELECTRICAL WORK - GENERAL

RELATED DOCUMENTS

The general provisions of the contract, including General Conditions and General Requirements, apply to the work specified in this section.

DESCRIPTION OF WORK

Furnish all labor, equipment and materials required for a complete installation of electrical wiring as indicated on the drawings or herein specified. Major work included in Section 16 shall be:

Arrange with the local utility companies for providing such electrical services if indicated on drawings or herein specified. It shall be the responsibility of this contractor to verify that the location, arrangement, voltage, phase and connections to utility service, as well as the required metering equipment, are coordinated with and in accordance with requirements of the local power company. If the requirements are at variance with these drawings or specifications, the contract price shall include any additional cost necessary to meet those requirements without extra cost to the Owner after the contract is entered into. Notify Architect of any changes required before proceeding with work. Any charges by the utility company for the electrical service to the facility shall be included in the contractor's bid price.

Remove or relocate all electrical or electronic services located on or crossing through the project property, either above or below grade, which would obstruct the construction of the project or conflict in any manner with the complete project or any code pertaining thereto.

Furnish and install a complete electrical light and power system as indicated.

Connect all meters, switchboards, panelboards, circuit breakers, power outlets, convenience outlets, switches, lighting fixtures, and/or other equipment forming part of the electrical system.

Connect all electrical equipment whether furnished by this contractor or by others and whether shown on electrical plans or not.

Install and connect all starters furnished by this contractor or others.

Furnish and install all disconnect switches not included as an integral part of equipment for all electrical equipment whether furnished by this contractor or others and where required by NEC.

Procure and pay for permits and certifications as required by local and state ordinances and Fire Underwriters certificate of inspection. Obtain approval for all work indicated on plans and in specifications from all agencies and authorities having jurisdiction.

Visit the site and determine conditions which affect this contract. Failure to do so will in no way relieve the Contractor of his responsibility under his contract. Make such adjustments to work as required by the actual conditions encountered.

Submit to the Architect a certificate of final inspection from local and/or state inspection authorities.

### DRAWINGS

The drawings indicate diagrammatically the extent, general character, and the approximate location of the work to be performed. Omissions of details of work, mounting hardware, fittings, j-boxes, outlet boxes, pull boxes, supports, connectors, accessories and/or adaptors or other details which are evidently necessary to carry out the intent of the drawings and specifications shall be provided, connected and/or installed. Where the work is indicated but with minor details omitted, furnish and install the work complete so as to perform its intended functions. Refer to the Architectural and Mechanical drawings for building details and for mechanical equipment installation details, and fit electrical work thereto.

Take finish dimensions at the job site in preference to using scale dimensions.

Where the information on the drawings is in conflict with the specifications the contractor shall incorporate the more stringent conditions into the bid price.

Except as noted above, make no changes in or deviations from the work as shown or specified except on written order of the Architect.

### MANUFACTURERS DRAWINGS AND DATA

Within twenty (20) days after award of contract, submit six (6) copies of manufacturer's drawings to the Architect for review of the following items (if applicable):

- Panelboards
- Disconnect Switches
- Fire Stopping
- Lighting Fixtures
- Occupancy Sensors
- Lighting Control Panels

Submittals shall be bound and include a cover sheet listing all items being submitted. Partial submittals will not be acceptable. Shop drawings of a specific item or system shall be in one

submittal. Drawings of power equipment shall contain exact details of device placement, phasing, and numbering in elevation form.

Submit a 1/2" = 1'-0" scale drawing of the main electrical room showing the location of all electrical equipment, code clearances, anchorage, conduit stub up, etc. and any possible conflicts with other trades.

#### STANDARD OF MATERIALS

All materials shall be new and listed by the Underwriters Laboratories as conforming to these standards.

Material substitutions will be considered only when evidence of equality and suitability, satisfactory to the Architect has been presented in writing, with samples if requested by the Architect. All proposed substitutions shall be approved in writing at least seven (7) days prior to the bid date.

It shall be understood that the Architect has the authority to reject any material or equipment used which is not specified or approved, or showing defects of manufacture or workmanship, before or after such material or equipment is installed.

#### PROGRESS OF WORK

Schedule work as necessary to cooperate with other trades, Do Not delay other trades. Maintain necessary competent mechanics and supervision to provide an orderly progression of the work.

Be informed as to equipment being furnished by other trades, but not liable for added cost incurred by equipment substitutions made by others which require excess electrical wiring or equipment above that indicated on drawings or specified. The contractor providing the equipment shall be responsible for the additional costs.

#### WORKMANSHIP

All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance upon completion.

Balance loads as equally as possible on the service, panel busses, feeders, and branch circuits.

Upon completion of work, test the entire electrical system and show it to be in perfect working order in accordance with the intent of the drawings and specifications.

The contractor shall have all systems ready for operation and an electrician available to assist in the removal of panel fronts, coverplates, fixture doors, etc., at the final inspection and any other scheduled inspections.

All work shall be in accordance with the National Electrical Code, and the codes, rules and regulations of all bodies having jurisdiction.

#### INSURANCE

This contractor shall carry Workmen's Compensation Insurance, and Public Liability Insurance, and shall save Owner free from claims or suits arising out of the performance of this contract.

#### PROTECTION OF PERSONS AND PROPERTY DURING CONSTRUCTION

Take all precautions necessary to provide safety and protection to persons and the protection of materials and property.

Protect items of equipment from stains, corrosion, scratches, and any other damage or dirt, whether in storage, at job site or installed. No damaged or dirty equipment, lenses, or reflectors will be accepted.

#### EXCAVATION, CUTTING AND PATCHING

Provide cutting and patching, under the supervision of the General Contractor, as required for the work in Section 16. Coordinate with other trades as work progresses so cutting and patching will be minimal.

#### ROOF PENETRATIONS

Furnish roof flashing for all equipment, installed under Section 16, which penetrates through the roof. Flashing shall be approved by the Architect prior to installation.

#### EQUIPMENT ENCLOSURES

All exterior equipment and devices shall have NEMA Type 3R enclosures unless indicated otherwise on the plans.

#### CLEANING UP

During the progress of work, keep the Owner's premises in a neat and orderly condition, free from accumulation of debris resulting from this work. At the completion of the work, remove all material, scrap, etc. not a part of this Contract.

#### OPERATING AND MAINTENANCE INSTRUCTIONS

## SECTION 16000

Turn over to the Architect one set of reproducible "as built" drawings, one set of all equipment catalogs and maintenance data, and one set of shop drawings on all equipment requiring same. Explain and demonstrate the electrical systems to Owner and/or Owner's representative.

### GUARANTEE

Guarantee that all work executed under this Section 16 will be free from defects of workmanship and materials for a period of one (1) year from date of final acceptance of this work. Promptly repair, replace, or otherwise make good, upon notification, any defect becoming apparent during this period, at no cost to Owner.

### TEMPORARY SYSTEMS

The Electrical Contractor shall be responsible for furnishing and installing equipment and materials necessary for providing electrical power where needed for the construction of the project in accordance with all OSHA regulations.

All temporary wiring shall be installed so as not to interfere with the new construction and shall be installed in a safe and approved manner.

Temporary service shall be provided by this contractor at a central point on each floor to supply the needs of the various trades. This contractor shall also provide adequate construction lighting as required by Local, State, and Federal regulations.

It shall be the responsibility of the electrical contractor to visit the site prior to submitting bids and thoroughly review all existing conditions affecting the temporary systems.

### COORDINATION OF SERVICE WITH OTHER TRADES

It shall be the responsibility of the Electrical Contractor to coordinate the electrical service characteristics to each piece of electrically operated equipment with all trades.

Within ten (10) working days of notification to proceed with construction from the Architect, the Electrical Contractor shall notify in writing all trades providing electrically operated equipment of the service characteristic to each piece of equipment.

1/2" = 1"-0" scale drawings of the room containing the main electrical panel shall be provided showing the location of all electrical equipment and required clearances shall be provided for coordination of equipment locations.

A copy of this notification shall be provided to the General Contractor and the Architect.

Coordinate work so as to conform to the progress of the work of the other trades, and complete the entire installation as soon as the condition of the building permits.



In the event that interferences or conflicts develop, the Architect shall decide which equipment shall be relocated at no cost to owner regardless of which was first installed.

## PART 2 - ELECTRICAL DISTRIBUTION SYSTEM MATERIALS

### RELATED DOCUMENTS

The general provisions of the contract, including General Conditions and General Requirements apply to the work specified in this section.

### GENERAL

This section includes all basic materials for raceways, fittings, busways, conductors, panelboards, switchboards, etc., as required for a complete installation.

All materials shall be new and listed by Underwriters' Laboratories as conforming to these standards.

### CONDUITS

**RIGID METAL (GALVANIZED) CONDUIT:** Rigid metal conduit shall be mild steel piping, galvanized inside and outside, and conform to ASA Specification 080.1 and Underwriters' Laboratories Specifications. By Sprang, Republic, Wheatland, Triangle or Pittsburgh.

**INTERMEDIATE METAL CONDUIT (IMC):** IMC shall be hot dipped galvanized inside and outside and manufactured in accordance with U.L. Standard #6 or #1242. By Allied or approved equal.

**ELECTRICAL METALLIC TUBING (EMT):** EMT shall be high grade steel electro-galvanized outside and lacquer or enamel coating inside and conform to ASA Specifications 080.1 and Underwriters' Laboratories Specifications. By Sprang, Republic, Wheatland, Triangle or Pittsburgh.

**RIGID NONMETALLIC CONDUIT (PVC):** PVC conduit shall be of high impact Schedule 40 PVC and shall conform to Underwriters' Laboratories Standard UL-651. PVC may be installed below grade only except for the grounding electrode conductor. By Pittsburgh, R.G. Sloan or Carlon.

### COUPLINGS AND CONNECTORS

RIGID & IMC: By Raco, Efcor, Republic or Appleton.

EMT: EMT fittings shall be all steel type. Set-screw type is approved. Pressure indented type will not be approved. All connectors to be insulated. By Appleton, Raco or Efcor.

PVC: PVC fittings shall be of high impact PVC Schedule 40. Joints shall be made with PVC solvent cement as recommended by manufacturer. By Pittsburgh, R.G. Sloan or Carlon.

### BUSHINGS

All rigid bushings 1-1/4" and larger shall be the insulating type. All other bushings shall be OZ Mfg. Co., Type B or Efcor, Type 55 insulated metallic type, or by Sylvania.

### CONDUIT ACCESSORIES

Conduit clamps and supports by Efcor, Steel City, or G.A. Tinnerman. Conduit fittings by Pyle-National, Crouse-Hinds and Appleton.

### JUNCTION BOXES (THRU 4-11/16")

SHEET METAL: To be standard type with knockouts made of hot dipped galvanized steel, By Steel City, Raco, Appleton or approved equal.

CAST: To be type FS, FD, JB, GS or SEH as required for application.

### JUNCTION AND PULL BOXES (LARGER THAN 4-11/16")

To be cast metal for all below grade exterior use and where indicated on plans. All other shall be oil tight, JIC boxes not less than 16 gauge, Hoffman type "CH" boxes.

### GUTTERS

Up to and including 8" x 8" shall be a standard manufacturer's item as manufactured by Square D, ITE or B & C Co. Special gutters shall be made of code grade galvanized sheet steel with hinged covers having approved fastening devices. At each location shown for gutters, install a wood backboard, not less 3/4" thick, painted on both sides with two (2) coats of gray enamel, mount all equipment thereon. Conductors serving a gutter shall be extended without reduction in size, for the entire length of the gutter.

Tap-offs to the switches and other items serviced by the gutter shall be made with Penn Union or Anderson Split-Bolt connectors for copper conductors. Properly tape and insulate all joints to attain the same insulation rating as the cable insulation.

### OUTLET BOXES

Standard type with knockouts, made of hot dipped galvanized steel, Ceiling outlet boxes shall be 4" octagon 1-1/2" deep or as noted in plans, or larger if required to be sized to accommodate devices and conductors as per NEC Article 370.

Boxes shall be provided with approved 3/8" fixture studs where required. Except where located in concrete block, switch and receptacle boxes shall be 4" square for single gang installation. Appropriate gang boxes shall be used for mounting ganged switches.

Coordinate depth of boxes with wall construction. Boxes used with exposed conduit shall be 4-inch square utility boxes.

Exterior Boxes: Galvanized cast-iron with fittings as appropriate. Make weatherproof with gasketed covers.

### BUILDING WIRE AND CABLE

Conductors shall have the current carrying capacities of copper as per N.E.C., with 600 volt type THHN insulation, and shall be #12 AWG minimum. All Conductors shall be copper. Conductors #12 and #10 shall be solid copper, larger sizes shall be stranded copper. By Phelps Dodge, Rome, Simplex, General Cable, Okonite, Anaconda or Southwire. Conductors installed in underground or exterior conduit shall be type XHHW.

### FIXTURE WIRE

Conductors for fixtures of 300 watts or less shall be #14 type TFFN, for fixtures of more than 300 watts #12 type TFFN shall be used. Conductors in channel of fluorescent fixtures shall be type THHN or RHH. Conductors shall be by either Dodge, Anaconda, Rome General Cable or Southwire.

### CONTROL AND SIGNAL WIRE

Conductor type TFF, minimum size #16 copper and fully color coded, shall be used. Conductors shall be by Phelps Dodge, Anaconda, Rome, General Cable or Southwire.

### WIRING DEVICES

Unless noted otherwise, switches shall be A.C. type as made by Hubbell, P & S, G.E. or Leviton. Unless noted otherwise, receptacles shall be Hubbell, Bryant, P & S, G.E. or Leviton. Color shall be gray unless noted otherwise. Receptacles in toilets, above kitchen counters, adjacent to sinks and in exterior locations shall be GFI type.

### SPECIAL PURPOSES RECEPTACLES

See plans for special receptacles required in various locations. Provide matching plugs when required for connecting equipment.

### FINISHES

Unfinished areas shall have exposed conduit, surface mounted boxes, gray switches and outlets, and galvanized metal coverplates with beveled edges.

All switch and receptacle device plates in finished areas shall be polished stainless steel or as directed by the Architect and unless otherwise noted.

### SAFETY SWITCHES

Switches shall be NEMA Heavy Duty Type HD and Underwriters' Laboratory listed. Safety switches shall be Challenger, Cutler Hammer, Square D, General Electric, or ITE.

All safety switches for equipment with remote controls shall be equipped with a control circuit disconnect interlock.

A permanently installed engraved micarta plate shall be installed on each disconnect switch or combination starter identifying the equipment served.

Locate disconnects adjacent to equipment on suitable structure or mount on equipment. Mount disconnects for outside HVAC units no higher than height of unit. A disconnect shall not be required other than the CB which provides power to equipment when equipment is within sight and not greater than 50 feet from CB. Verify disconnect size from equipment nameplate data.

### FUSES

Class RK-1 time delay fuse for protecting circuit breakers. Bussman Limitron or equal. Class RK-5 time delay fuse for protection of motors and transformers. Bussman Fusetron or equal. 200K AIC at rated voltage. Fuses shall be used only where indicated on drawings.

### MANUAL MOTOR STARTERS

Thermal overload protection shall be provided for single phase motors by manual motor starters with overload units rated as required by the specific motor to be served. Starters shall be by Cutler Hammer, General Electric, Square D, or ITE with NEMA Type 1 enclosure or NEMA Type 3R enclosure where installed outdoors.

### PANELBOARDS

Furnish and install circuit breaker panelboards as indicated in the panelboard schedule and where shown on the drawings. All busses shall be copper. Panelboards shall be of a dead-front safety

type equipped with thermal magnetic molded case circuit breakers with frame and trip ratings as shown on the schedule.

Circuit breakers shall be quick-make, quick-break, thermal magnetic trip indicating and shall have common trip on all multipole breakers. Automatic tripping shall be clearly shown by the breaker handle taking a position between ON and OFF when the breaker is automatically tripped. Connection to the buss shall be bolt on. All circuit breakers supplying HVAC equipment shall be HACR type.

Buss bar connections to the branch circuit breaker shall be the "distributed phase" or "phase sequence" type. Single-phase, three-wire panel board bussing shall be such that any two adjacent single-pole breakers can be installed in any location. Three-phase, four-wire bussing shall be such that any three adjacent single-pole breakers are individual connected to each of the three different phases in such a manner that two or three-pole breakers can be installed at any location. All current carrying parts of the buss assembly shall be plated. Main ratings shall be as shown in the panelboard schedule on the plans. Terminals for feeder conductors to the panelboard mains and neutral shall be UL listed as suitable for the type of conductor specified. Terminals for branch circuit wiring, both breaker and neutral, shall be UL listed as suitable for the type conductor specified. Busses shall be copper.

Panelboards not shown to be rated for service entrance equipment shall be equipped with an isolated neutral and a grounding buss.

Arrange breakers as shown on the panelboard schedules.

The panelboard shall have an engraved micarta plate permanently installed on the front of the panel with the panel name, current rating, voltage rating and origin of feeder serving the panelboard. The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with the National Electrical Code, NEMA, and UL standards for panelboards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel.

The panelboard front shall be of the hinged front type with doors equipped with flush, brushed steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. Fronts shall not be removable with door in the locked position. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. The directory shall be typed to identify the load fed by each circuit. Fronts shall be of code gauge, full finished steel with rust inhibiting primer and baked enamel finish.

Panelboards shall be listed by Underwriters' Laboratories and bear the UL label. Panelboards shall be rated for use as Service Entrance Equipment where required by the National Electrical Code. Panelboards shall be by General Electric, Square D, Cutler-Hammer or as noted on the plans.

## LIGHTING FIXTURES

### GENERAL

Fixtures shall be furnished as shown on the fixture schedule on the drawings. *Equivalent* fixture substitutes by Lithonia, Daybrite, Cooper Lighting, and Hubbell will be accepted.

It shall be the responsibility of the contractor to verify the exact type ceiling, type fixture mounting and trim, and recessing depth of all recessed fixtures prior to purchasing any fixtures.

Fluorescent fixtures shall be polyester powder coat painted after fabrication, shall have minimum .125" lenses (unless thicker lenses are called for by plans), and shall be rated for installation in fire rated ceilings.

Regardless of part numbers identified on the light fixture schedule, it shall be the contractor's responsibility to verify the proper operating voltage of light fixtures according to the plans prior to purchasing any fixtures.

### BALLASTS

Fluorescent ballasts shall be high frequency electronic type by Magnetic Triad, Lutron, Osram-Sylvania or Motorola. Ballasts shall be approved by E.T.L. and have U.L. and C.B.M. label. Use ballasts approved for use in fire rated ceilings and equipped with fuses for each ballast. Three lamp fixtures shall be equipped with a single ballast. Ballast factors shall be greater than .9, total harmonic distortion less than 20%, power factor greater than .93, and crest factor less than 1.7.

Fluorescent electronic ballasts shall carry a five (5) year manufacturer's warranty.

HID lamp ballasts shall be high power factor (90 or greater) type.

### LAMPS

Furnish and install 125 volts inside frosted incandescent lamps of proper wattage for all outlets so designated on the drawings. Lamps shall be manufactured by General Electric Company, ITE, Sylvania, or Norelco.

Furnish and install fluorescent, metal halide and quartz lamps of proper size and type as shown on drawing. Lamps shall be manufactured by General Electric Company, Phillips, or Osram-Sylvania. HID lamps shall be ceramic type.

Fluorescent lamps shall be 3500° K T8 lamps by General Electric, Phillips, Osram-Sylvania, or Norelco.

PL fluorescent lamps shall be 3500° K.

Exit light fixtures shall be equipped with LED type lamps.

All lamps shall be installed new, immediately prior to final inspection, and shall not be used for construction purposes.

#### GUARANTEE AND WARRANTY - LAMPS

The guarantee and warranty shall apply to lamps as follows:

Fluorescent & Metal Halide Lamps: Guarantee for one year.

Quartz Lamps: Guarantee for four months.

Incandescent Lamps: Guarantee for one month.

Guarantee shall begin from date of final acceptance.

#### PART 4 - ELECTRICAL DISTRIBUTION SYSTEM - INSTALLATION

##### RELATED DOCUMENTS

The general provisions of the contract, including General Conditions and General Requirements, apply to the work specified in this section.

##### GENERAL

This section includes the installation of the complete electrical distribution system.

##### CONDUIT INSTALLATION

Where rigid conduits enter boxes, secure conduit in place with approved insulated fittings. Conduit ends shall be carefully plugged during construction. Use of running threads is absolutely prohibited. Conduit shall be joined with approved conduit couplings.

Install conduit runs to avoid proximity to steam or hot water pipes. In no place shall a conduit be run within 3" of such pipes except where crossings are unavoidable, then conduit shall be kept at least 1" from the covering of the pipe crossed.

Before installing raceways for motors and fixed appliances verify the location of all motor and appliance connections. Locate and arrange all raceways accordingly.

Verify all door swings with architectural plans before roughing in light switches.

Provide flexible conduit connections to all motors and/or any equipment which has moving or vibrating parts. Liquidtight flexible metal conduit, "Sealtite", shall be used in all cases exposed to moisture and in mechanical equipment rooms. Sealtite shall be in lengths not exceeding 18" and shall have a separate grounding conductor installed with proper connectors.

Where no raceway sizes or wire sizes are shown on plans provide and install as required by NEC.

Interior wiring as shown on plans will typically be concealed in ceilings walls or floors except in mechanical/electrical rooms, janitor closets, unfinished rooms and other such rooms where conduits are typically exposed.

Exposed conduit runs shall be parallel and/or at right angles to building walls and/or partitions. All exposed conduit shall be painted to match surface upon which it is installed.

Where conduit crosses a structural expansion joint, an approved conduit expansion fitting will be installed.

Leave a 14 gauge galvanized steel pull wire in all empty conduits.

Conduit shall be cut square and the ends reamed after threading.

Fasten conduit securely in place by means of approved conduit clamps, hanger supports, and fastenings. Arrangement and method of fastening all conduits subject to Architect's direction and approval.

Apply two coats of asphaltum paints to all underground rigid metallic conduit. Carefully retouch any breaks in the paint and allow it to dry before covering. Leave the conduit exposed until after the Architect's inspection.

Conduits shall be sized in accordance with the National Electrical Code as amended to date, except when the size is shown larger on the drawings.

E.M.T. may be used where concealed in ceiling or walls or in other areas where there is no danger of mechanical injury. Rigid or IMC conduit shall be used in floor slabs, where embedded in concrete, areas exposed to moisture and danger of mechanical injury, in hazardous areas.

Schedule 40 PVC conduit may be used below grade. A separate green grounding conductor shall be run in all circuits in PVC conduit. The transition from PVC to rigid galvanized conduit shall be made in the horizontal run below grade. No PVC shall be installed above grade except for the grounding electrode conductor.



Conduit with an external diameter larger than 1/3 the thickness of the slab shall not be placed in the slab. Conduits in slabs shall not be spaced closer than 3 diameters on center. No conduits shall be installed in porous fill.

#### SLEEVES, INSERTS, AND SUPPORTS

Provide and install No. 16 gauge galvanized steel or iron sleeves in all walls, floors, ceilings, and partitions. Sleeves shall have no more than 1/2" clearance around pipes and insulation.

The contractor shall furnish to other responsible trades all sleeves, inserts, anchors and other required items which are to be built in by other trades for securing of all hangers or other supports by the Contractor.

The contractor shall assume all responsibility for the placing and sizing of all sleeves, inserts, etc., and shall either directly supervise or give explicit instructions for their installation.

The contractor shall seal all conduits through floors, smoke partitions, floor partitions, and sound barrier walls with a sealant approved for the application.

Through the floor conduit penetrations shall be sealed water tight.

Penetrations of fire rated partitions shall be sealed with an approved fire sealant resulting in the completed penetration having the same fire rating as the partition. Fire sealant shall be intumescent caulk, putty, sheet and/or wrap/strip as required to attain the proper rating. Penetrations of fire rated ceilings, floors or walls shall be a UL listed assembly. Caulk shall be equal to 3M CP25 N/S and/or S/L, putty equal to 3M Fire Barrier Moldable Putty, sheet equal to 3M CS195, and wrap/strip equal to 3M FS195. The installation shall be in accordance with the manufacturer's installation to attain the required fire partition rating. Equal products by Dow Corning and Hilti will be accepted.

Furnish and install steel angles and channels as required for mounting and bracing heavy equipment and conduits. Steel shall be securely bolted or welded to structure and equipment bolted to the steel framework. Obtain the approval of the Architect prior to welding.

#### WIRE AND CABLE INSTALLATION

No conductor shall be smaller than #12 except where so designated on the drawings or specified elsewhere.

Joints and splices in wire shall be made with solderless connectors, and covered so that insulation is equal to conductor insulation. Wire nuts shall not be used for conductor #8 and larger.

No splices shall be pulled into conduit.

Both conductors and conduit shall be continuous from outlet to outlet.

No conductor shall be pulled into the conduit until the conduit is cleaned of all foreign matter.

All conduits shall have bushings with smooth beveled throats installed at both ends prior to installing conductors. Split bushings around conductors shall be taken to indicate that the conductors were pulled into conduit without the proper bushings installed and a basis for requiring the replacing of the conductors.

When installing parallel conductors, it is mandatory that all conductors making up the feeder be exactly the same length, the same size and type of conductor with the same insulation. Each group of conductors making up a phase or neutral must be bonded together at both ends in an approved manner.

#### FEEDER DESIGNATION

Non-ferrous identifying tags or pressure sensitive labels shall be securely fastened to all cables, feeders, and power circuits in vaults, pull boxes, manholes, switch gear and at termination of cables. Tags or labels shall be stamped or printed to correspond with markings on drawings so that feeder or cable number and phase can be readily identified.

#### COLOR CODING OF CONDUCTORS

The ungrounded (phase) conductors and the grounded (neutral) conductors of each voltage system shall be identified by the following color coding method:

120/208V, 3 phase, 4 Wire:

Grounded (neutral conductor).....White

Ungrounded Phase Conductors .....Black, Red, Blue

277/480V, 3 phase, 4 wire:

Grounded (neutral conductor).....Gray

Ungrounded Phase conductors.....Brown, Orange, Yellow

120/240V, 1 phase, 3 Wire:

Grounded (neutral conductor).....White

Ungrounded Phase Conductors .....Black, Red

120/240V, 3 phase, 4 Wire: (High Leg Delta)

Grounded (neutral conductor).....White

Ungrounded Phase Conductors .....Black, Orange, Red

High leg shall be "B" phase and shall be orange

Green shall be used for equipment grounding conductors only.

The insulation color or color markings shall be visible on conductors on both sides of splices, in panelboards, switches, junction boxes, and all other locations where the conductors are accessible.

### CIRCUITS AND BRANCH CIRCUITS

Outlets shall be connected to branch circuits as indicated on the drawings by circuit number adjacent to outlet symbols, home run arrows or as defined on plans and no more outlets than are indicated shall be connected to a circuit.

Verify power and connection requirements for all equipment before ordering electrical equipment or installation. Wire as required by equipment manufacturer and in compliance with the NEC. Obtain MOCP (maximum overcurrent protection) and MCA (minimum circuit amps) information from nameplate of actual HVAC equipment being installed and circuit accordingly.

### WIRE JOINTS

Except for motor feeds wire joints for #12 and smaller wire shall be made with twist on connectors equal to Buchanan Products B-Caps.

Wire joints for #12 motor feeders and for wire larger than #12 shall be made with solderless connectors and covered with Scotch #88 electrical tape so that the insulation is equal to the conductor insulation. Connectors by O-Z/Gedney, T&B, Blackburn, or equal. T&B Sta-Kon connectors or equal with insulating caps may be used on #12 and #10 solid conductor joints.

### OUTLET BOX INSTALLATION

Outlet boxes shall be securely fastened in place. Outlet boxes installed in metal stud construction shall be supported by brackets, equal to Caddy "H" series, screwed to the studs. Clip on brackets shall not be accepted.

Surface fixture outlet boxes shall be set so edge of cover comes flush with finished surface.

There shall be no more knockouts opened in any outlet box than are actually required.

Boxes shall be sealed during construction. Protect interiors (including panel cans) from paint and mortar.

Unless otherwise shown, centerline of boxes shall be the following distance above the finished floor:

Switches, General-----	4' 0"
Receptacles, General-----	1' 6"
Receptacles, over Counters-----	4"
Receptacles, above Countertops--	.2" above backsplash
Telephone Outlets, Wall-----	4' 0"
Thermostat Outlets-----	4' 6"

Symbols on drawings and mounting heights as indicated on drawings and in specifications are approximate only. The exact locations and mounting heights must be determined on the job and it shall be the contractor's responsibility to coordinate with all trades to secure correct installation; i.e., over counters, in or above back splashes, in stud walls, and other specific construction features.

Mount all receptacles vertical with ground pole down. In all exposed block walls use the nearest mortar joint as approved by the Architect.

### LIGHTING FIXTURES

Support of all fixtures shall be the responsibility of this contractor. Fixtures shall be supported independent of ceiling from structural members of building. The contractor shall submit a typical hanging detail to the Architect before installing any fixtures.

The Contractor shall be responsible for verifying the type and locations of any and all fire rated assemblies shown on the Architectural plans and shall install all required fixture protection equipment in accordance with those assemblies.

All recessed grid fixtures shall be wired by flexible metal conduit individually to a junction box and not wired fixture to fixture.

Fixture conductors shall be connected by soldering and taping or by approved connectors.

Thoroughly clean all fixture lens and reflectors immediately prior to the final inspection.

### ELECTRICALLY POWERED EQUIPMENT AND CONTROLS

Provide and install power circuits for all electrically powered equipment and controls.

The electrical contractor shall not be responsible for furnishing and installing any control wiring necessary for the temperature control and/or ventilation systems unless indicated otherwise on the plans or elsewhere in these specifications. The mechanical contractor shall furnish and install all control wiring required for the temperature control and /or ventilation systems.

The mechanical contractor shall furnish all motor starters and/or combination motor starters for the temperature control and/or ventilation equipment unless otherwise indicated on the electrical

plans or elsewhere in these electrical specifications. The electrical contractor shall install all motor starters, except for equipment with factory installed starters, for the temperature control and/or ventilation equipment.

Where required by the National Electrical Code and/or other applicable codes or authorities, and where indicated on the electrical plans, the electrical contractor shall furnish and install an approved disconnecting means for all electrically powered equipment and/or controllers for such equipment. The location, rating, and enclosure for the disconnecting means shall be as required by the National Electrical Code and/or other applicable codes or authorities. The electrical contractor shall furnish and install such disconnecting means whether the disconnecting means is or is not shown on the electrical plans.

Where the disconnecting means shown on the electrical plans has a rating greater than the required code rating, the greater rating device shall be installed. An approved horsepower rated fusible safety switch shall be installed where the circuit overcurrent protection does not provide overload protection for the equipment served and where required to meet the equipment's listing requirements. Manual motor starters with thermal overload protection may be used in lieu of safety switches for individual motors under 1 horsepower. The disconnecting means shall be as manufactured by General Electric, Square D, Cutler Hammer, or ITE.

Each disconnecting means and starter shall have an engraved micarta plate permanently attached giving the source of power, i.e., panelboard and circuit number.

#### OUTLETS AND CONDUIT FOR OTHER TRADES:

Provide concealed 4" square outlet boxes with empty conduit extending above ceiling and any other control conduit as may be requested by HVAC, fire alarm, security system, door access or plumbing contractors. Whether shown on plans or not, provide a weatherproof, GFI type receptacle located within 25 feet of all exterior HVAC equipment.

#### AUXILLIARY SYSTEM CONDUITS:

Provide a 3/4" conduit from all telephone, data, intercom and cable TV outlet wall boxes and extend above ceiling. Terminate all conduits which are stubbed-up into ceiling with plastic bushings with smooth beveled throats. Where space allows stub-up all conduits 12" above ceiling.

#### VERIFY:

The word "verify" when used in plans or specifications shall mean to verify location and wiring requirements before circuiting and circuit in accordance with the manufacturer's recommendations and in compliance with the NEC.

UNDERGROUND INSTALLATIONS:

Where conduit is installed below grade, the minimum burial depth shall be 24" unless installed under building slab (where there is no minimum burial depth). Where rigid metallic conduit is installed below grade, coat conduit and couplings with (2) coats of asphaltum paint.

Underground primary conduit installed in coordination with the power company shall be installed at a depth as directed by the power company. Avoid all existing utilities. Any existing utilities damaged shall be repaired at contractor's expense and as directed by Architect. Restore any damaged paving to match existing.

IDENTIFICATION:

Provide 1" high laminated phenolic nameplates permanently installed (with 3/8" high white letters on black) on the front of all disconnect switches, CB enclosures, panelboards, contactors, transformers, transient voltage surge suppressors and starters.

END OF SECTION



SECURITY ACCESS AND SURVEILLANCE

SECTION 13850

FA1600C ARCHITECT AND ENGINEER  
SPECIFICATION FOR SECURITY SYSTEM



**SECTION 13850**  
**DETECTION AND ALARM**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Section Includes
  - 1 Control Panel
  - 2 Associated Equipment
- B. Products Installed But Not Supplied Under This Section
  - 1 Section 16140 - Wiring Devices
  - 2 Section 16530 - Emergency Lighting
- C. Related Sections
  - 1 Section 13700 - Security Access and Surveillance
  - 2 Section 13800 - Building Automation and Control

**1.02 REFERENCES**

- A. Underwriters Laboratories (UL):
  - 1. UL 268 – Smoke Detectors for Fire Protective Signaling Systems
  - 2. UL 365 – Police Station Connected Burglar Alarm Units and Systems
  - 3. UL 609 – Local Burglar Alarm Units and Systems
  - 4. UL 611 – Central Station Burglar-Alarm Units
  - 5. UL 636 – Holdup Alarm Units and Systems
  - 6. UL 684 – Local, Central Station, and Remote Station
  - 7. UL 864 – Control Units for Fire Protective Signaling Systems
  - 8. UL 985 – Household Fire Warning System Units
  - 9. UL 1023 – Household Burglar-Alarm System Units
  - 10. UL 1076 – Proprietary Burglar-Alarm Units and Systems
  - 11. UL 1610 – Central-Station Burglar-Alarm Units
- B. Federal Communications Commission (FCC):
  - 1 Code of Federal Regulations Title 47 - Part 15 – Radio Frequency Devices
  - 2 Code of Federal Regulations Title 47 -Part 68 – Connection of Terminal Equipment to the Telephone Network
- C. National Fire Protection Association (NFPA):
  - 1. NFPA70 – National Electrical Code.
  - 2. NFPA72- National Fire alarm Code

### 1.03 SYSTEM DESCRIPTION

- A. The system shall be a Fire/Burglary/Access Control/CCTV Switching System that includes the following capabilities:
  - 1. Listed for UL Commercial Fire and Burglary.
  - 2. Supports up to 128 zones.
  - 3. Supports up to eight (8) separate partitions.
  - 4. Supports up to 150 users.
  - 5. Supports commercial wireless devices.
  - 6. Provides integrated security, access control, and CCTV switching and commercial fire capability.
  - 7. Provides supervision of peripheral devices.
  - 8. Supports up to 96 optional relay outputs.
  - 9. Supports long-range radio (LRR) communication.
  - 10. Provides scheduling capability to allow for automated operations.
  - 11. Supports up to eight (8) alphanumeric paging devices.
  - 12. Monitors smoke detector maintenance signals.
  - 13. Capable of being installed using existing wiring.

### 1.04 SUBMITTALS

- A. Submittals shall include manufacturer data sheets for all major system components.

### 1.05 QUALITY ASSURANCE

- A. The alarm manufacturer shall be certified as being compliant with ISO9001.

## **PART 2 PRODUCTS**

### 2.01 SYSTEM PERFORMANCE

- A. Control Panel - The control panel shall be an eight (8)-partition, UL commercial fire and burglary control panel that supports up to 128 zones using basic hardwired, polling loop, and wireless zones. It shall also provide supervision of two (2) notification appliance output circuits (NAC), RF receivers, and relay modules. In addition, the control shall provide the ability to schedule time-driven events, and allow certain operations to be automated by pressing a single button. The system shall be capable of interfacing with an ECP long-range radio (LRR)

unit that can send Contact ID messages, and alphanumeric paging devices. The control shall provide integrated access control and CCTV-switching capability with the use of a single downloader and database.

1. Basic Hardwired Zones - The control shall provide eight (8) style-B hardwire zones with the following characteristics:
  - a. EOLR supervision (optional for zones 3-8): Shall support N.O. or N.C. sensors (EOLR supervision required for UL installations).
  - b. Zones/Points shall be individually assignable to one of eight (8) partitions.
  - c. Supports up to 32 two-wire smoke detectors on two selected zones (64 total).
  - d. Supports four-wire smoke or heat detectors on any zone (power to four-wire smoke detectors must be supervised with an EOL device).
  - e. Supports up to 50 two-wire latching glass break detectors on one selected zone.
  - f. Individually assignable to Notification Appliance (NAC) outputs and/or auxiliary relays.
2. Optional Expansion Zones
  - a. Polling Loop Expansion – The control shall support up to 120 additional hardwire zones using a built-in two-wire polling (multiplex) loop interface. The polling loop shall provide power and data to remote point modules, and constantly monitor the status of all zones on the loop. Maximum current draw shall not exceed 128 mA. The polling loop zones shall have the following characteristics:
    - (1) Interface with RPM (Remote Point Module) devices that provide Class B, Style Y (e.g., 4208U/4208SN) or a combination of Class B, Style Y, and Class A, Style Z (e.g., 4208SNF) zones.
    - (2) Individually assignable to one of eight (8) partitions.
    - (3) Individually assignable to NAC outputs or auxiliary relays.
    - (4) Supervised by the control panel.
    - (5) A 12,000 ft (3658 m) wire run capability without using shielded cable.
    - (6) Each RPM (Remote Point Module) shall be tamper protected.
  - b. Wireless Expansion – The control shall support up to 128 wireless zones using a 5800 series RF receiver (fewer if using hardwire

and/or polling loop zones). Wireless zones shall have the following characteristics:

- (1) Supervised by control panel for check-in signals (except certain non-supervised transmitters).
- (2) Tamper-protection for supervised zones.
- (3) Individually assignable to one of the partitions.
- (4) Individually assignable to bell outputs and or auxiliary relays.
- (5) Support wireless devices listed for Commercial Fire & Burglary using the 5881ENHC RF Receiver.

3. Partitions – The control shall provide the ability to operate eight (8) separate areas, each functioning as if it had its own control. Partitioning features shall include:

- a. A Common Lobby partition (1-8), which can be programmed to perform the following functions:
  - (1) Arm automatically when the last partition that shares the common lobby is armed.
  - (2) Disarm when the first partition that shares the common lobby is disarmed.
- b. A Master partition (9), used strictly to assign keypads for the purpose of viewing the status of all eight (8) partitions at the same time (master keypads).
- c. Assignable by zone.
- d. Assignable by keypad/annunciator.
- e. Assignable by relay to one or all eight (8) partitions.
- f. Ability to display fire and/or burglary and panic and/or trouble conditions at all other partitions' keypads (selectable option).
- g. Certain system options selectable by partition, such as entry/exit delay and subscriber account number.

4. User Codes – The control shall accommodate 150 user codes, all of which can operate one or all partitions. Certain characteristics must be assignable to each user code, as follows:

Authority level (Master, Manager, or several other Operator levels). Each User Code (other than the installer code) shall be capable of being assigned the same or a different authority level for each partition that it will operate.

Opening/Closing central station reporting option.

Specific partitions that the code can operate.

Global arming capability (ability to arm all partitions the code has access to in one command).

Use of an RF (button) to arm and disarm the system (RF key must first be enrolled into the system).

5. Peripheral Devices – The control shall support up to 31 addressable ECP devices, which can be any combination of keypads, RF receivers, relay modules, annunciator modules, and interactive phone modules. Peripheral devices have the following characteristics:
  - a. Each device set to an individual address according to the device's instructions.
  - b. Each device enabled in system programming.
  - c. Each device's address shall be supervisable (via a programming option).
6. Keypad/Annunciator – The control shall accommodate up to 31 keypads or six (6) touch-screen (i.e.; advanced user interface) keypads. The keypads shall be capable of the following:
  - a. Performing all system arming functions.
  - b. Being assigned to any partition.
  - c. Providing four programmable single-button function keys, which can be used for:
    - (1) Panic Functions –activated by wired and wireless keypads; reported separately by partition.
    - (2) Keypad Macros –32 keypad macro commands per system (each macro is a series of keypad commands). Assignable to the A, B, C, and D keys by partition.
7. Optional Output Relays - A total of 96 relay outputs shall be accommodated using any combination of ECP or polling loop relay modules. Each ECP relay module shall provide four (4) Form C (normally open and normally closed) relays for general-purpose use or two (2) Class-B, Style-Y supervised notification appliance circuit outputs, when using the 4204CF module. The relays shall be capable of being:
  - a. Programmed to activate in response to system events.
  - b. Programmed to activate using time intervals.
  - c. Activated manually using a keypad command.
  - d. Assigned an alpha descriptor.

- e. Used for Class B, Style-Y supervised bell outputs (4204CF module).
  - f. A combination of 4204 (ECP) and 4101SN (polling loop) relays.
8. Optional Vista Interactive Phone Module – The control shall support the ADEMCO 4285/4286 VIP Modules, which permit access to the security system in order to perform the following functions:
- a. Obtain system status information.
  - b. Arm and disarm the security system.
  - c. Control relays.
9. Optional LED Annunciator – The control shall support the ADEMCO FSA-8 and FSA-24 annunciators, which are capable of:
- a. Visually identifying a zone or point that is in alarm or trouble.
  - b. Programmable for system silence/reset.
  - c. Supporting up to 96 LEDs in one system.  
Supporting a total of four (4) FSA-24 or 12 FSA-8 annunciators in one system.
  - d. Supporting an optional keyswitch, FSAKSM module, for UL listed Silence and Reset capability.
10. Notification Appliance Circuits (NAC) – The Control Panel shall internally provide two supervised NAC outputs for operating fire and burglar alarm notification appliances. It shall also support additional supervised bell outputs when using 4204CF relay modules. Each NAC output shall be rated at 10-14 VDC, 1.7 amp max power limited. Total alarm current draw when using two NAC outputs shall not exceed 2.3 amps for battery independent operation.
11. Auxiliary Relay – A built-in Form C relay shall be provided. The relay contacts shall be rated at 28 VAC/VDC, 2.8 amps maximum. The relay shall support:
- a. Alarm activation.
  - b. Trouble/supervisory activation.
  - c. Reset of four-wire smoke detectors.
  - d. Battery saving feature.
  - e.
12. Integrated Access Control – The control shall be capable of the following:
- Providing a command that activates relays to allow access doors to open (e.g., lobby door), lights to be turned on or off, etc.

Becoming a fully integrated access control system by using numerous VistaKey Single-Door Access Control Modules.

Supporting up to eight (8) VistaKey Access Control Modules. The VistaKey Access Control Modules shall use the same Compass Downloader as the FA1600C and shall be programmable from the Compass Downloader or the Keypad/Annunciators.

Assigning any number of access control relays to each partition (up to 96 for the system).

Supporting up to 250 access cardholders using VistaKey.

Connecting to the ADEMCO PassPoint Access Control System via the Vista Gateway Module (VGM).

13. CCTV Switching – The System shall be capable of supporting the VistaView 100 CCTV Switching System. The CCTV system shall be fully integrated and be event driven by Fire, Burglary or Access events. When cameras are not event driven, they shall be driven by an automatic preset dwell time. The system shall also be capable of:  
Activating the CCTV system via a Form-C relay output.  
Operating up to 60 camera inputs and 30 video outputs.
14. Commercial Wireless Equipment – The Control shall be compatible with UL Listed Commercial Wireless Fire & Security equipment including:
  - a. ADEMCO 5881ENHC Commercial Fire/Burg Receiver. - The receiver shall be capable of receiving as many points as the control panel is rated for. Up to two (2) receivers may be used on any system. Receivers may be remotely located anywhere on the system Keypad/Annunciator bus.
  - b. ADEMCO 5808LST Wireless Photoelectric Smoke and Heat Detector - The device shall be UL 268 listed and shall have Maintenance Alert capability and Automatic Drift Compensation.
  - c. ADEMCO 5809 Wireless 135D Fixed Temperature and Rate of Rise Heat Detector - The device shall be UL 521 listed for commercial applications.

ADEMCO 5817CB Wireless Universal Contact Monitoring Transmitter - This device shall be capable of making any conventional UL listed contact device a wireless device. The device shall be UL listed for commercial fire and burglary applications as follows: UL 864, 985 for fire and UL 365, 609, 1023, 1076 and 1610 for security and nurse call.

ADEMCO 5869 Wireless Hold Up Switch/Transmitter - This device shall be UL 636 listed for commercial burglary applications.

15. Optional Keyswitch – The control shall support the ADEMCO 4146 Keyswitch on any one of the system's eight (8) partitions. If used, zone 7 is no longer available as a protection zone.
16. Voltage Triggers – The system shall provide voltage triggers, which change state for different conditions. Used with long-range radio (LRR) equipment or other devices such as a remote keypad sounder, keyswitch ARMED and READY LEDs, or a printer to print the system's event log.
17. Event Log – The System shall maintain a log of different event types (enabled in programming). The event log shall provide the following characteristics:
  - a. Stores up to 512 events.
  - b. Viewable at the keypad or through the use of Compass software.
  - c. Printable on a serial printer using a 4100SM Module including zone alpha descriptors.
  - d. Stores PassPoint access control events.
  - e. Sends printed events to up to eight (8) alphanumeric pagers using a 4100APG pager interface module.
18. Scheduling -Provides the following scheduling capabilities:
  - a. Open/close schedules (for control of arming/disarming and reporting).
  - b. Holiday schedules (allows different time windows for open/close schedules).
  - c. Timed events (for activation of relays, auto-bypassing and un-bypassing, auto-arming and disarming, etc.).
  - d. Access schedules (for limiting system access to users by time)
  - e. End User Output Programming Mode (provides 20 timers for relay control).
  - f. Automatic adjustment for daylight savings time.
19. Communication Features -Supports the following formats and features for the primary and secondary central station receivers:
  - a. Formats
    - (1) ADEMCO Low Speed (Standard or Expanded).
    - (2) SESCOA/Radionics.
    - (3) ADEMCO Express.
    - (4) ADEMCO High Speed.



- (5) ADEMCO Contact ID.
    - (6) Long-Range Radio Interface.
  - b. Backup reporting – The system shall support backup reporting via the following:
    - (1) Secondary phone number.
    - (2) ECP long-range radio (LRR) interface.
    - (3) Option to select long-range radio (LRR) or dialup as the primary reporting method (dynamic signaling feature).
- 20. Audio Alarm Verification Option - Provides a programmable Audio Alarm Verification (AAV) option that can be used in conjunction with an output relay to permit voice dialog between an operator at the central station and a person at the premises.
- 21. Cross-Zoning Capability - Helps prevent false alarms by preventing a zone from going into alarm unless its cross-zone is also faulted within five (5) minutes.
- 22. Pager Interface – The Control Panel shall be capable of sending event information to an alphanumeric pager via a 4100APG pager interface module.
- 23. 24-Volt Power Supply – The Control Panel shall be compatible with a 24Volt power supply module. The module shall supply two (2) 24 vdc, 3.4 amps, rectified, unfiltered outputs, which power:
  - a. Alarm notification appliances, including but not limited to sirens horns, bells and strobes.
  - b. Auxiliary devices capable of operating using full-wave rectified unfiltered voltage.
- 24. Exit Error False Alarm Prevention Feature – The System shall be capable of differentiating between an actual alarm and an alarm caused by leaving an entry/exit door open. If not subsequently disarmed, the control panel shall:
  - a. Bypass the faulted E/E zone(s) and/or interior zones and arm the system. Generate an Exit Error report by user and by zone so the central station knows it was an exit alarm and who caused it.
- 25. Enhanced Fire Walk-Test Mode – The Control Panel shall provide the installer with the following features:
  - Automatic test of all integrated remote point module (RPM) devices, equipped with an automatic test feature.

While automatic test is in progress all fire zones that remain untested shall be displayed.

An event log shall be capable of logging the results of tested and untested zones.

The ability to report the result of tested and untested zones to the central station.

26. Built-in User's Manual and Descriptor Review - For end-user convenience, the control panel shall contain a built-in User's Manual. It shall include the following capabilities:
  - a. By depressing any of the function keys on the keypad for five (5) seconds, a brief explanation of that function shall scroll across the alphanumeric display.
  - b. By depressing the READY key for five (5) seconds, all programmed zone descriptors shall be displayed (one at a time). This feature shall provide a check for installers and ensure all descriptors have been entered properly.
  - c.
27. Programming - The Control shall be capable of being programmed locally or remotely using the ADEMCO Compass Downloader and shall be capable of:
  - d. Uploading and downloading all programming information at 300 baud.
  - e. Uploading and displaying firmware revision levels from the control.

The control panel shall be the ADEMCO FA1600C Commercial Fire/Burglary Partitioned Security System or equivalent.

## 2.02 ENCLOSURE

- A. The Control Panel shall be enclosed in a metal cabinet, suitable for wall mounting. The dimensions shall not exceed 18 inches (45.7 cm) in height, 14.5 inches (36.8 cm) in width or 4.3 inches (10.9 cm) in depth.

## 2.03 ELECTRICAL POWER REQUIREMENTS

- A. System Power – The Fire and Burglary Alarm System shall operate using standard 120 volts AC, 50/60 Hz power.
  1. Control Primary Power – Transformer power shall be 18 VAC, 72 VA.
  2. Backup Battery – A rechargeable 12 VDC, gel type, lead acid backup battery shall be provided. The battery shall be rated between 12 and 34ampere hours (AH).

3. Alarm Power – Alarm power shall be 12 VDC, 1.7 amps for each bell output
4. Auxiliary Standby Power – Standby power shall be 12 VDC, 1 amp maximum.
5. Total Power -Combined auxiliary standby and alarm currents shall be 2.3 amps.
6. Fusing – The battery input, auxiliary, and bell outputs shall be protected using PTC circuit breakers. All outputs shall be power limited.
7. Power Supply - A 24-volt power supply shall provide 24 vdc, 3.4 amps full-wave rectified, unfiltered outputs.

#### 2.04. ENVIRONMENTAL CONDITIONS

- A. Environmental Conditions – The Fire and Burglary Alarm System shall be designed to meet the following environmental conditions.
  - 1 Storage Temperature – The system shall be designed for a storage temperature of -10° C to 70°C.
  - 2 Operating Temperature - The system shall be designed for an operating temperature of 0° C to 50°C (32° F to 120°F).
  - 3 Humidity -The system shall be designed for normal operation in an 85% relative humidity environment.
  - 4 Electromagnetic Interference – The system shall meet or exceed the requirements of FCC Part 15, Class B devices, FCC Part 68, IEC EMC directive.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Submission of a proposal confirms that the Contract Documents and site conditions are accepted without qualifications unless exceptions are specifically noted.
- B. The site shall be visited on a regular basis to appraise ongoing progress of other trades and contracts, make allowances for all ongoing work, and coordinate the requirements of this contract in a timely manner.

### 3.02 INSTALLATION

A. The System shall be installed and tested in accordance with the Manufacturer's Installation instructions. The following conditions are applicable:

- 1 In order to ensure a complete, functional System, for bidding purposes, where information is not available from the Owner upon request, the worst case condition shall be assumed.
- 2 Interfaces shall be coordinated with the Owner's representative, where appropriate.
- 3 All necessary backboxes, pullboxes, connectors, supports, conduit, cable, and wire shall be furnished and installed to provide a complete and reliable System installation. Exact location of all boxes, conduit, and wiring runs shall be presented to the Owner for approval in advance of any installation.
- 4 All conduit, cable, and wire shall be installed parallel and square with building lines, including raised floor areas. Conduit fill shall not exceed forty percent (40%). All wires shall be gathered and tied up to create an orderly installation.

### 3.03 TESTING AND CERTIFICATION

A. The Contractor shall demonstrate the functionality of the System upon completion of installation, documenting the result of all tests and providing these results to the Owner. The System shall be tested in accordance with the following:

1. The Contractor shall conduct a complete inspection and test of all installed equipment. This includes testing and verifying connection to equipment of other Divisions.
2. The Contractor shall provide staff to test all devices and all operational features of the System for witness by the Owner's representative and the Authority having jurisdiction. The Contractor shall provide two-way radio communications to assist in the testing. All testing must be witnessed by the owner's representative, prior to acceptance.
3. The testing and certification shall take place as follows:
  - a. System shall be tested in conjunction with the manufacturer's representative.
  - b. All deficiencies noted in the above test shall be corrected.
  - c. Test results shall be submitted to the consultant or owner's representative.

System test witnessed by owner's representative and correction of any deficiencies noted.

The owner's representative shall accept the System.

System test shall be witnessed by the Authority having Jurisdiction, and any deficiencies that are noted shall be corrected.

4. A letter of certification shall be provided to indicate that the tests have been performed and all devices are operational.

END OF SECTION

## SECTION 16721

### PART 1.0 - GENERAL

#### 1.1. DESCRIPTION:

A. This section of the specification includes the furnishing, installation, and connection of the microprocessor-controlled fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panel, auxiliary control devices, annunciators, power supplies, and wiring as shown on the drawings and specified herein.

B. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for protected premises signaling systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.

C. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

D. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

E. Underwriters Laboratories Inc. (UL) - USA:

	No. 50 Cabinets and Boxes
	No. 268 Smoke Detectors for Fire Protective Signaling
Systems	
	No. 864 Control Units for Fire Protective Signaling
Systems	
	No. 268A Smoke Detectors for Duct Applications.
	No. 521 Heat Detectors for Fire Protective Signaling
Systems.	
	No. 228 Door Closers/ HOLDERS for Fire Protective
Signaling Systems.	
	No. 464 Audible Signaling Appliances.
	No. 1971 Visual Signaling Appliances.
	No. 38 Manually Actuated Signaling Boxes.
	No. 346 Waterflow Indicators for Fire Protective
Signaling Systems.	
	No. 1481 Power supplies for Fire Protective
Signaling Systems.	

F. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the system's integrity.

#### 1.2. SCOPE:

A. A customer provided microprocessor controlled fire detection and alarm system shall be installed in accordance with the specifications and drawings.

B. Basic Performance:

1. Initiating Device Circuits (IDC) shall be wired Class B.

2. Notification Appliance Circuits (NAC) shall be wired Class B.

1.3. SUBMITTALS:

A. General:

All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent equipment (compatible UL Listed) from other manufacturers may be substituted for the specified equipment.

B. Shop Drawings:

Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, and complete wiring point-to-point diagrams.

C. Manuals:

Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s) including technical data sheets (with model numbers to be used indicated).

D. Certifications:

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.4. GUARANTY:

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance.

1.5. POST CONTRACT MAINTENANCE:

Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the major equipment manufacturer for a period of five (5) years after guaranty expiration.

As part of the submittal work, include a quote for a maintenance contract to provide all maintenance tests and repair as required after the warranty period. Include also a quote of hourly rates, response

time and technician travel costs. Submittals which do not include a complete statement of maintenance costs will not be accepted.

1.6. PERFORMANCE CRITERIA / APPLICABLE PUBLICATIONS:

The publications and/or standards listed below form a part of this specification. The publications are referenced in text by the basic designation only.

A. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and shall be installed in compliance with the UL listing.

B. Local and State Building Codes.

C. All requirements of the Authority Having Jurisdiction (AHJ).

1.7. PERFORMANCE CRITERIA / APPROVALS:

A. Each system must have proper listing and/or approval from the nationally recognized agency responsible for the particular area.

UL Underwriters Laboratories Inc.

ULC Underwriters Laboratories Canada

MEA Material Equipment Acceptance (NYC)

CSFM California State Fire Marshal

1.8. BATTERIES

A. Shall be sealed, Gel-Cell acid type.

B. Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.

C. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

D. If necessary to meet standby requirements, external battery and charger systems may be used.

1.9. SYSTEM COMPONENTS:

A. A built in Digital Alarm Communicator Transmitter (DACT) will be included in the panel. The DACT is an interface for communicating digital information between a fire alarm control panel and a UL-Listed central station.

1. The DACT shall be fully integrated into the control panel.



2. The DACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to three different telephone numbers.

3. The integrated DACT shall be programmed through the panels keypad along with all panel programming. The panel shall also have the ability with an optional programming kit, to upload and download programming from a PC.

4. The DACT shall be capable of transmitting events in at least 15 different formats. This ensures compatibility with existing and future transmission formats.

5. Communication shall include vital system status such as:

- Independent Zone (Alarm, trouble, non-alarm, supervisory)
- AC (Mains) Power Loss
- Low Battery and Earth Fault
- System Off Normal
- 12 and 24 Hour Test Signal
- Abnormal Test Signal (per UL requirements)
- Phone Line Failure

6. The DACT shall support independent zone/point reporting when used in the Contact ID format. This enables the central station to have exact details concerning the origin of the fire or response emergency.

7. Provide Transient Voltage Surge Suppression (TVSS) in accordance with NFPA 72-2002 section 4.4.4.3 for both phone lines.

B. Enclosure:

The control panel shall be housed cabinet suitable for surface mounting. An optional semi-flush trim ring shall be available for finished installations.

C. Power Supply:

1. The Main Power Supply for the Fire Alarm Control Panel shall provide all control panel and peripheral device power needs, as well as 3.0 amperes of 24 VDC power for each NAC.

2. The power supply shall provide an integral battery charger for use with batteries up to 17 AH.

3. Provide Transient Voltage Surge Suppression (TVSS) in accordance with NFPA 72-2002 section 4.4.4.3 on dedicated 15-amp branch circuit.

D. Field Charging Power Supply: The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.

1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60 hour standby.

2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.

3. The FCPS shall include an attractive surface mount backbox.

4. The Field Charging Power Supply shall include the ability to delay the AC fail delay per 1993 NFPA requirements.

5. The FCPS include power limited circuitry, per 1995 UL standards.

6. Provide Transient Voltage Surge Suppression (TVSS) in accordance with NFPA 72-2002 section 4.4.4.3 on dedicated 15-amp branch circuit.

E. Specific System Operations

1. Walk Test Operation

a. Walk Test mode shall test Initiating Device Circuits and Notification Device Circuits from the field without returning to the panel to reset the system.

b. Upon activation of an IDC, all outputs normally activated by the tested zone shall activate for four seconds. Subsequent activation of devices on the same zone will activate outputs for one on second.

c. Inducing a trouble into the initiating circuit shall activate the controlled outputs and remain activated until the trouble is cleared.

2. Alarm Verification Operation

When an alarm condition is detected on an Initiating Device Circuit which has been programmed for Alarm Verification shall cause the panel to remove power to that IDC to reset 2 wire detectors. After a short reset and retard time if that circuit returns within the confirmation time it will cause a verified alarm.

3. Waterflow Operation

a. All Initiating Device Circuits shall be programmable to provide Waterflow detection. If an alarm occurs on a Waterflow zone, all Notification Appliance Circuits which are programmed to activate for that zone will not be affected by the silence switch.

b. A programmable retard timer shall be available for waterflow circuits. This timer shall allow retards for 1-89 seconds.

#### 4. Supervisory Operation

An alarm on a Supervisory circuit shall activate all programmed (mapped) outputs, activate a common Supervisory LED, and activate the zone which is in alarm.

#### 5. Signal Silence Operation

All Notification Appliance Circuits of the system shall be capable of being programmed to deactivate with depression of the Signal Silence switch.

#### 6. Pre-signal Operation

The control panel shall have the capability of operation in a pre-signal mode.

#### F. Programmable Electronic Sounders:

1. Electronic sounders shall operate on 24 VDC nominal.

2. Electronic sounders shall be field programmable without the use of special tools, to provide slow whoop, continuous, or interrupted tones with an output sound level of at least 90 dBA measured at 10 feet from the device.

3. Shall be flush or surface mounted as show on plans.

G. Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:

1. The maximum pulse duration shall be 2/10 of one second.

2. Strobe intensity shall meet the requirements of UL 1971.

3. The flash rate shall meet the requirements of UL 1971.

#### H. Manual Fire Alarm Stations

1. Manual fire alarm stations shall be non-code, non-breakglass type, equipped with key lock so that they may be tested without operating the handle.

2. Stations must be designed such that after an actual activation, they cannot be restored to normal except by key reset.

3. An operated station shall automatically condition itself so as to be visually detected, as operated, at a minimum distance of 100 feet (30.5 m) front or side.

4. Manual stations shall be constructed of high impact Lexan, with operating instructions provided on the cover. The word FIRE shall appear on the manual station in letters one half inch (12.7 mm) in size or larger.

#### I. Conventional Photoelectric Area Smoke Detectors

1. Photoelectric smoke detectors shall be a 24 VDC, two wire, ceiling-mounted, light scattering type using an LED light source.

2. Each detector shall contain a remote LED output and a built-in test switch.

3. It shall be possible to perform a calibrated sensitivity and performance test on the detector without the need for the generation of smoke. The test method shall test all detector circuits.

4. A visual indication of an alarm shall be provided by latching Light Emitting Diodes (LEDs). These LEDs shall flash every 10 seconds, indicating that power is applied to the detector.

5. The detector shall not go into alarm when exposed to air velocities of up to 3000 feet (914.4 m) per minute.

#### J. Conventional Ionization Type Area Smoke Detectors

1. Ionization type smoke detectors shall be a two wire, 24 VDC type using a dual unipolar chamber.

2. Each detector shall contain a remote LED output and a built-in test switch.

3. It shall be possible to perform a calibration sensitivity and performance test on the detector without the need for the generation of smoke.

4. A visual indication of an alarm shall be provided latching Light Emitting Diodes (LEDs). This LED shall flash every 10 seconds, indicating that power is applied to the detector.

5. The detector shall not alarm when exposed to air velocities of up to 1,200 feet (365.76 m) per minute. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.

#### K. Duct Smoke Detectors

Duct smoke detectors shall be a 24 VDC type with visual alarm and power indicators, and a reset switch. Each detector shall be installed upon the composite supply/return air ducts(s), with properly sized air sampling tubes.

L. Projected Beam Detectors

1. The projected beam type shall be a 4-wire 24 VDC device.
2. The detector shall be listed to UL 268 and shall consist of a separate transmitter and receiver capable of being powered separately or together
3. The detector shall operate in either a short range (30' - 100') or long range (100' - 330') mode.
4. The temperature range of the device shall be -22 degrees F to 131 degrees F.
5. The detector shall feature a bank of four alignment LEDs on both the receiver and the transmitter that are used to ensure proper alignment of unit without special tools.
6. Beam detector shall feature automatic gain control which will compensate for gradual signal deterioration from dirt accumulation on lenses.
7. The unit shall be both ceiling and wall mountable.
8. The detector shall have the ability to be tested using calibrated test filters or magnet activated remote test station.

M. Automatic Conventional Heat Detectors

1. Automatic heat detectors shall have a combination rate of rise and fixed temperature rated at 135 degrees Fahrenheit (57.2 Celsius) for areas where ambient temperatures do not exceed 100 degrees (37.7 Celsius), and 200 degrees (93.33 Celsius) for areas where the temperature does not exceed 150 degrees (65.5 Celsius).
2. Automatic heat detectors shall be a low profile, ceiling mount type with positive indication of activation.
3. The rate of rise element shall consist of an air chamber, a flexible metal diaphragm, and a factory calibrated, moisture-proof, trouble free vent, and shall operate when the rate of temperature rise exceeds 15 degrees F (9.4 degrees C) per minute.
4. The fixed temperature element shall consist of a fusible alloy retainer and actuator shaft.
5. Automatic heat detectors shall have a smooth ceiling rating of 2500 square feet (762 square meters).

N. Waterflow Switches:

1. Waterflow switches shall be an integral, mechanical, non-coded, non-accumulative retard type.

2. Waterflow switches shall have an alarm transmission delay time which is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds.

3. All waterflow switches shall come from a single manufacturer and series.

4. Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor.

5. Where possible, locate waterflow switches a minimum of one (1) foot from a fitting which changes the direction of the flow and a minimum of three (3) feet from a valve.

0. Sprinkler and Standpipe Valve Supervisory Switches:

1. Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.

2. PIV (post indicator valve) or main gate valves shall be equipped with a supervisory switch.

3. The switch shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.

4. The supervisory switch shall be contained in a weatherproof aluminum housing, which shall provide a 3/4 inch (19 mm) conduit entrance and incorporate the necessary facilities for attachment to the valves.

5. The switch housing shall be finished in red baked enamel.

6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.

7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

8. The LED type annunciator shall provide the following operations:

a. The Annunciator shall provide alarm and trouble indications for each zone circuit using a red and yellow, long-life LED's. The annunciator shall also have an "ON-LINE" LED, common

trouble LED, local piezo electric signal, local acknowledge/ lamp test switch and custom zone/function identification labels.

b. Wiring to the annunciator shall be supervised.

c. The annunciator shall be flush or surface mountable, as indicated on the drawings.

d. The annunciator shall provide alarm resound, with flashing of new conditions.

9. The LED annunciator shall offer an interface to a graphic style annunciator and provide each of the features listed above.

### PART 3.0 - EXECUTION

#### 3.1. INSTALLATION:

A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

D. Manual pull stations shall be suitable for surface mounting on matching backbox, or semiflush mounting on standard single gang box, and shall be installed not less than 42 inches or more than 48 inches above the finished floor.

#### 3.2. TEST:

Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

A. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

B. Close each sprinkler system control valve and verify proper supervisory alarm at the FACP.

- C. Verify activation of all flow switches.
- D. Open initiating device circuits and verify that the trouble signal actuates.
- E. Open and short Notification appliance circuits and verify that the trouble signal actuates.
- F. Ground device circuits and verify response of trouble signals.
- G. Check proper operation of all alarm notification devices.
- H. Check installation, supervision, and operation of smoke detectors.
- I. Verify that each initiating device alarm signal is properly received and processed by the fire alarm control panel (Walk Test).
- J. Conduct tests to verify trouble indications for common mode failures, such as alternating current power failure.

### 3.3. FINAL INSPECTION:

At the final inspection a representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

### 3.4. INSTRUCTION:

Provide instruction as required to the building personnel and fire and safety personnel. "Hands-on" demonstrations of the operation of the system shall be provided.



## **SECTION 16725 INTERCOM**

### **PART 1 – GENERAL**

#### **1.01 GENERAL REQUIREMENTS**

- A. The conditions of the General Contract (General, Supplementary, and other Conditions) and the General Requirements are hereby made a part of this Section.
- B. All bids shall be based on the equipment as specified herein. The catalog numbers and model designations are that of the Quantum Multicom IP. The specifying authority must approve any alternate system.
- C. Contractors that wish to submit alternate equipment shall provide the specifying authority with the appropriate documentation, at least 15 business days prior to bid opening. The submitted documentation must provide a feature by feature comparison identifying how the proposed equipment meets the operation and functionality of the system described in this specification. Contractor shall provide adequate and complete submittal information, prior to bid date, which shall include but not limited to specification sheets, working drawings, shop drawings, and a demonstration of the system. Alternate supplier-contractor must also provide a list to include six installations identical to the system proposed.
- D. The contractor shall also provide the FCC registration number of the proposed system.
- E. Final approval of the alternate system shall be determined at the time of job completion. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate system at the contractor's expense.
- F. The contractor for this work shall be held to have read all of the bidding requirements, the general requirements of division 1, and contract proposal forms, and the execution of this work. The contractor will be bound by all of the conditions and requirements therein.
- G. The contractor shall be responsible for providing a complete functional system including all necessary components whether included in this specification or not.
- H. In preparing the bid, the contractor should consider that no claim will be made against the owner for any costs incurred by the contractor for any equipment demonstrations which the owner requests.

#### **1.02 SCOPE OF WORK**

- A. Furnish and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide a complete and operating school communications system including but not limited to:
  - 1. Administrative display phone with integrated 4x16 character display
  - 2. Administrative VoIP Phone
  - 3. Administrative phone
  - 4. Handsets
  - 5. Classroom speaker(s), ceiling- or wall-mounted
  - 6. Call initiation switches capable of placing normal, urgent or emergency calls

7. Telemedia control of VCRs, DVDs, Video-On-Demand laser disc players
  8. Built in Master Clock with 1024 events, 32 Schedules, including Daylight Savings Time, and 32 custom holiday events that can be assigned to any of the 64 multi-purpose zones
  9. Wall-mounted paging horns
  10. One built-in network interface port for system combining and LAN station-to-station calling and district-wide all-calls
  11. One built-in network interface port for first-time system configuration
  12. Built-in Web Server for full system programming with Quantum Commander
  13. Administrative Web-Browser Application for Programming and System Operation
- B. System can connect to the PSTN (Public Switched Telephone Network) by connecting it to analog CO trunks.
1. Telephone service with public utilities shall be arranged by the owner, in conjunction with the equipment supplier. Equipment supplier shall generate a one-page document that will provide the Owner with information concerning number of outside lines (minimum of 8, and a maximum of 960 per school, max of 99 Schools [facilities]).

### **1.03 SUBMITTALS**

- A. Specification Sheets shall be submitted on all items including cable types.
- B. Submit outline drawing of system control cabinet showing relative position of all major components.
- C. Shop drawings, detailing integrated electronic communications network system including, but not limited to, the following:
  1. Station wiring arrangement
  2. Equipment cabinet detail drawing
- D. Submit wiring diagrams showing typical connections for all equipment.
- E. Submit a numbered Certificate of Completion for installation, programming, and service training, which identifies the installing technician(s) as having successfully completed the technical training course(s) provided by the system manufacturer.

### **1.04 QUALITY ASSURANCE**

- A. All items of equipment shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.
- B. The contractor shall be an established communications and electronics contractor that has had and currently maintains a locally run and operated business for at least 5 years. The contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty privileges.

- C. The contractor shall show satisfactory evidence, upon request, that he or she maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The contractor shall maintain at his or her facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

#### **1.05 SINGLE SOURCE RESPONSIBILITY**

- A. Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and minimum of 35 years experience in the industry. The supplying contractor shall have attended the manufacturer's installation and service school. A certificate of this training shall be provided with the contractor's submittal.

#### **1.06 SAFETY / COMPLIANCE TESTING**

- A. The communications system shall bear the label of a Nationally Recognized Testing Laboratory (NRTL) such as ETL, and be listed by their re-examination service. All work must be completed in strict accordance with all applicable electrical codes, under direction of a qualified and factory approved distributor, to the approval of the owner.
- B. The system is to be designed and configured for maximum ease of service and repair. All major components of the system shall be designed as a standard component of one type of card cage. All internal connections of the system shall be with factory-keyed plugs designed for fault-free connection.
- C. The printed circuit card of the card cage shall be silk-screened to indicate the location of each connection.

#### **1.07 IN-SERVICE TRAINING**

- A. The contractor shall provide a minimum of eight hours of in-service training with this system. These sessions shall be broken into segments, which will facilitate the training of individuals in the operation of this system. Operators Manuals and Users Guides shall be provided at the time of this training.

#### **1.08 WIRING**

- A. System wiring and equipment installation shall be in accordance with good engineering practices as established by the EIA and the NEC. Wiring shall meet all state and local electrical codes. All wiring shall test free from all grounds and shorts.
- B. All communication system wiring shall be labeled at both ends of the cable. All labeling shall be based on the room numbers as indicated in the architectural graphics package.

#### **1.09 PROTECTION**

- A. The contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.
- B. The contractor shall note in his system drawings, the type and location of these protection devices as well as all wiring information. Such devices are not to be installed above the ceiling.

## 1.10 SERVICE AND MAINTENANCE

- A. The contractor shall provide a five year equipment warranty of the installed system against defects in material and workmanship. All materials shall be provided at no expense to the owner during normal working hours. The warranty period shall begin on the date of acceptance by the owner/engineer.
- B. The contractor shall, at the owner's request, make available a service contract offering continuing factory authorized service of this system after the initial warranty period.
- C. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

## PART 2 - EQUIPMENT SPECIFICATION

### 2.01 MANUFACTURERS

- A. Manufactures: Subject to compliance with requirements specifications, provide the following system:
  - 1. Quantum Multicom IP manufactured by Bogen Communications, Inc., Ramsey, NJ
- B. The Specifying authority must approve any alternate system.
- C. The intent is to establish a standard of quality, function and features. It is the responsibility of the bidder to insure that the proposed product meets or exceeds every standard set forth in these specifications.
- D. The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.

### 2.02 EQUIPMENT

- A. CONSOLE
  - 1. Rack-mounted equipment shall be Bogen Model TCPER
    - a. 42" Rack
    - b. 61" Rack
    - c. 77" Rack

- 2. MCRMP / MCMP / QRC24-48 (Compact Rack System)

Rack Mount full, Mini-System, or Wall Mount panel. Shall include the following components:

Quantum Processor Card QSPC1  
 Analog Card  
 Station Card  
 Telephone Interface Card  
 5 volt / 12 volt Power Supply  
 26 volt Power Supply(s)  
 Audio Program Module Interface Assembly

- 3. MCRMF / MCMF / QRC24-48

- a. MCRMF Rack mounting mainframe. Includes built-in ventilation fans and the following circuit cards:

- Quantum Processor Card
- Analog Card
- Station Card
- Telephone Interface Card
- Ribbon Cable Assembly

- b. MCMF Wall Mount mounting mainframe. Utilizes convection cooling and the following circuit cards:

- Quantum Processor Card
- Analog Card
- Station Card
- Telephone Interface Card

- c. QRC24 / QCR48 Compact Quantum Rack System Mainframe (1 per Mini-System). Includes built-in ventilation fan and the following circuit cards:

- Quantum Processor Card
- Analog Card
- Station Card
- Telephone Interface Card

#### 4. MCRRP / MCRRC / MCRC

- 1. Relay Module/Card

#### 5. MCRCA

- a. Ribbon Cable Assemblies

#### 6. Program Sources

- a. Tape Player & AM/FM Tuner
- b. 5-Disc CD Player
- c. AM/FM Tuner
- d. Desktop Paging Microphone

#### 7. Power Amplifiers

- a. 60-Watt Amplifier
- b. 125-Watt Amplifier
- c. 250-Watt Amplifier

#### 8. Station Equipment

- a. Administrative Display Phone
- b. Administrative VoIP Phone
- c. Administrative Wall-Mount Phone
- d. Administrative Desktop Phone
- e. Call switch with Privacy
- f. Rocker-style Call Switch

## 9. Optional Equipment

- a. Telephone Access Card
- b. Telemedia Control Unit
- c. Television Control Unit
- d. Handheld Infrared Transmitter

## 2.03 COMPONENTS AND DESCRIPTIONS

- A. The Quantum Multicom IP must be capable of supporting the existing Multicom 2000 hardware and functions as well as the new features across the Quantum Processor's interfaced over the LAN. The VoIP capabilities of the QSPC1 Quantum Processor Card will enable the support of the features across the various processors' nodes. The sections below cover how the system will handle each of the existing and the new features in the QSPC1 product. Systems that do not allow the reuse of existing equipment or are not backwards compatible shall not be deemed acceptable. Systems that don't allow processors to be seamlessly integrated via the LAN are not considered equal.
- B. Quantum Multicom IP
  - 1. The Quantum facility shall have a minimum of one node/processor and a maximum of 64 interconnected nodes/processors. A maximum of 99 facilities can be interconnected into a district.
  - 2. The station numbers, program buses, etc. shall be identified with a QSPC1#, Station card# and port# or QSPC1#, program#.
  - 3. Audio Information will be transmitted between the processors on the LAN using VoIP technology. Quantum will utilize all of the existing Multicom 2000 hardware except the current processor card. Thus making Quantum Multicom IP backwards-compatible with existing Multicom 2000 systems.
  - 4. The processor software shall be upgradeable via Quantum Commander. The Quantum automatically reboots after it installs the software upgrade. If for some reason the newly installed software will not boot properly, the system shall revert to the previous working load.
  - 5. It shall be possible for Quantum schools to exchange 'station-to-station' calls and 'inter-facility All-Call paging' to a single facility or all facilities in a district using VoIP technology.
  - 6. The primary QSPC1 shall be configured to act as a Gateway for facility point-to-point calls. Using Quantum Commander, every facility shall be configured with the IP addresses of the primary QSPC1 systems of all the other known facilities (maximum of 98 additional), and an organizationally private multicast IP address (i.e. 239.x.y.z series), which shall be used for inter-facility paging.
  - 7. The maximum number of simultaneous inter-facility point-to-point calls supported is based on the actual performance of the network and the CPU load. The voice quality of the inter-facility calls may vary based on the network conditions.
  - 8. The system shall facilitate the playing of short audio clips repetitively played until stopped by the Quantum Commander User or administrative display phone MCDS4 whichever occurs earlier.
  - 9. A built-in Master Program Clock, with battery backup, shall be included to automatically control class change or other signals. The Master Program Clock shall have 1024 events that may be programmed into any of the 32 time signaling schedules, and/or 32 flexible holiday schedules. Systems that rely on external master clock shall not be considered equivalent.

10. Network Time Synchronization. The system shall be capable of periodic update/synchronization of the processor's time with a Network Time Server via the school's LAN network. Systems that do not provide Network Time Synchronization will not be deemed equivalent.

#### C. Quantum Commander

1. The processor utilizes a web-based programming tool. The Quantum Commander is built into the QSPC1 processor card and upon boot up, users can login to the Quantum Commander Web Server via their web browser.
2. The Quantum Commander shall be broken into three access levels depending on user access credentials. Systems that do not provide at least three (3) levels of access are not equal.
3. Only the Administrator and Technician shall have access to add/delete/modify the database objects.
4. Users shall have display only access to see the data objects that include configuration, alarms, and performance data and perform certain operations based on the user's CoS (Class of Service).

#### D. Administrative Display Phone

1. Administrative Display Phones shall be Bogen Model MCDS4. The administrative telephone display panel shows the time of day and day of week, the current time signaling schedule, and the station numbers and call-in priority of staff stations that have called that particular station. A 3-key response is used to scroll the display, and answer or erase normal, urgent, and security calls. Depending upon the system programming, an administrative station can use display menus to activate zone pages, alarm signals and external functions, as well as select program sources and distribute or cancel a program to any or all speakers or zones.
2. Administrative Display Phones shall have the ability to dial and have the option of dialing either the loudspeaker or phone at each station location. The system shall automatically switch from phone-to-intercom communication to phone-to-phone communication when the staff handset or enhanced staff phone on the receiving end of the call is lifted.
3. The Administrative Display Phone shall display the classroom number of any station that calls 911. This feature will notify the main office when a classroom has dialed 911 emergency centers so that administrators can direct emergency personnel to the correct physical location in the building when they arrive. Systems that do not provide this feature will not be deemed equal.

#### E. Administrative Wall Display

1. Administrative wall display shall be a Bogen Model MCWD. The wall display shows the time of day, current time signaling schedule that is running, and the station numbers and call-in priority of call switches, and emergencies from Administrative VoIP Phone and Administrative Phones.
2. The Administrative Wall Display shall display the classroom number of any station that calls 911. This feature will notify the main office when a classroom has dialed the 911 emergency centers so that administrators can direct emergency personnel to the correct physical location in the building when they arrive. Systems that do not provide this feature will not be deemed equal.

#### F. Administrative Phone

1. Classroom phones shall be one of the following Bogen Model(s)
  - a. MCDS4 – Administrative Display Phone
  - b. QSIP1 – Administrative VoIP Phone (Desk or Wall)
  - c. MCESS – Administrative Desk Phone

d. MCWESS – Administrative Wall Phone.

2. The Station goes Off-Hook and dials the 3- to 6-digit (preceded by an \* if calling a telephone instead of loudspeaker) number of the desired station. The call is routed to any station (admin/staff). The classroom phone shall be capable of the following features:
  - a. Emergency Call involves going off hook and flash hook the switch at least four times. The Call is then switched to the assigned Admin Phone. This requires the display of the architectural number on the Administrative Display phone and or Wall Display. Systems that do not provide this feature are not equivalent.
  - b. Alarm Distribution
  - c. Audio Program toggle On/Off
  - d. Call Forward activation for All-Calls/Busy/No Answer/Busy or No Answer
  - e. Cancel Call Forward
  - f. Conference Calling
  - g. Transfer Call
  - h. Dial administrative display phone, dial the station number to call to the speaker or dial the station number preceded with \* to call the phone. The call shall be routed to the administrative display phone and/or administrative wall display showing the architectural number that is calling.
  - i. Emergency All-Call shall be broadcasted to all the stations in the facility.
  - j. Place Outside Call
  - k. Remote Answer
  - l. Single-Zone/All-Station Page
  - m. Call Waiting Tone for Outside Calls, and it shall be possible to feed the call waiting tone to the Administrative Phone during a conversation.

G. VoIP Display Phone

1. The Station goes Off-Hook and dials the 3- to 6-digit (preceded by an \* if calling a telephone instead of loudspeaker) number of the desired station. The call is routed to any station (admin/staff). The classroom VoIP Display phone shall be capable of the following features:
  - a. Speed dials
  - b. Missed call logging
  - c. Ethernet pass through jack
  - d. Alarm Distribution
  - e. Audio Program On/Off
  - f. Call Forward activation for All-Calls/Busy/No Answer/Busy or No Answer



- g. Cancel Call Forward
- h. Dial administrative phone, dial the station number to call to the speaker or dial the station number preceded with \* to call the phone. The call shall be routed to the administrative display phone and/or administrative wall display showing the architectural number that is calling.
- i. Emergency All-Call shall be broadcasted to all the stations in the facility.
- j. Place Outside Call
- k. Single-Zone/All-Station Page

#### H. Classroom Call Staff Stations

- a. Staff Stations shall be Bogen Model:
  - 1. CA21B – Call Switch with Privacy
  - 2. CA15C – Call Switch
  - 3. HS201C-202C – Handset
- b. Shall be capable of Normal/Urgent/Emergency Calls
- c. Normal/Urgent Call involves pressing the Call Switch once or lifting the Telephone Handset. The Call is then switched to the Administrative Display Phone. This requires the display of the architectural number on the Administrative Display Phone and/or Wall Display.
- d. Emergency Call involves pressing the emergency call switch; flash hook the switch at least 4 times in a non-dial analog handset with Call Level Normal or Urgent; pressing the call switch or hook switch one time in a non-dial analog handset with Call Level Emergency only. The Call is then switched to the Administrative Display Phone. This requires the display of the architectural number on the Administrative Display Phone and/or Wall Display.
- e. Emergency Link Transfer - If the emergency call is unanswered by the Administrative Display Phone and the emergency link transfer is provisioned and programmed; the emergency call will be forwarded to the loudspeaker associated with that station. Any station/admin phone with speaker can be programmed for the Emergency Link Transfer except the Administrative VoIP Phone. Systems that do not provide Emergency Link Transfer will not be considered equal.

#### I. Intercom System Speakers

- 1. Classroom Speakers shall be Bogen:
  - a. Ceiling Speakers: CSD2X2 Drop-In Ceiling Speakers
  - b. Wall Speakers: MB8TSQ/SL Metal Box Speakers
- 2. Hallway Speakers shall be Bogen:
  - a. Ceiling Speakers: CSD2X2 Drop-In Ceiling Speakers
  - b. Wall Speakers: MB8TSQ/SL Metal Box Speakers
- 3. Outdoor / Gym / Locker Room Speakers shall be Bogen:
  - a. FMH15T mounted in BBSM6 surface-mounted vandal-resistant enclosure/BBFM6 flush-mounted vandal-resistant enclosure with FMHAR8 adapter ring and SGHD8 heavy duty grille

b. KFLDS30T Wide Dispersion Reentrant Horn Loudspeakers

4. Common Area Speakers shall be Bogen:

- a. HFCS1 High-Fidelity Ceiling Speakers
- b. OCS1 NEAR Orbit Ceiling Speakers
- c. OPS1 NEAR Orbit Pendent Speakers

#### J. Quantum Commander

1. The processor utilizes a web-based programming tool. The Quantum Commander is built into the QSPC1 processor card, and upon boot up, user can login to the Quantum Commander Web Server.
2. The Quantum Commander shall be broken into three access levels depending on user access credentials. Systems that do not provide at least three (3) Levels of access are not equivalent. The three levels are:
  - a. User
  - b. Administrator
  - c. Technician
3. Only the Administrator and Technician shall have access to add/delete/modify the database objects.
4. Users shall have display only access to see the data objects that include configuration, alarms, and performance data and perform certain operations based on the user's CoS (Class of Service).
5. The following Menu Items must be available on the Multicom IP Quantum Commander:
  - a. File - Open Database, New System, Save, Delete, Report and Exit, Upload Database, Download Database, Download Software, Diagnostics, Tones and Announcements, Relay Configuration, Program Distribution, Media Assignment, List Passwords, Add Password, and Change Password.

## 2.04 SYSTEM PARAMETERS

- A. The communication system shall be a Bogen Quantum Multicom IP, and shall provide a comprehensive communication network between administrative areas and staff locations throughout the facility. Nonvolatile memory shall store permanent memory and field-programmable memory. A system, which uses a battery to maintain system configuration information, shall not be acceptable.

The system shall provide no less than the following features and functions:

1. Telephonic communication (complete with DTMF signaling, dial tone, ringing and busy signals, and data display) on administrative stations shall use two wires. Systems that use more than two wires for communication, tones and data display shall not be acceptable.
2. Amplified-voice communication with loudspeakers shall use a shielded audio pair (shield can be used as one of the two required conductors for administrative phone or call-in switch).
3. The system shall be available in the following configurations:
  - a. MC2K Wall-mounted in a custom enclosure Quantum. Station capacity shall be from 24 to 130 stations each Node. All stations shall have the ability to support displays.

- b. MC2KR Rack-mounted Quantum. Station capacity shall be from 24 to 250 stations each Node. All telephone stations shall have the ability to support displays.
- c. QRC24 & QRC48 Compact Quantum Rack System. Station capacity shall be from 24 to 48 stations per node. All stations shall have the ability to support displays, with an option to add up to 8 Central Office phone lines.
- d. 2223/2233 MC2KR Rack-mounted and integrated with Bogen Multi-Graphic Series 2223 or Series 2233 equipment. In this configuration, Quantum Multicom IP system station capacity shall be expandable up to 240 stations in increments of 24 per node. All telephone stations shall have the ability to support displays. The Multi-Graphic system equipment provides the following: backup fail safe intercom and paging functions (Note: the systems operate independently; if one were to fail, the other provides intercom for student safety), plus two additional program channels, and additional Multi-Graphic functions. It shall be possible, by use of a separate call-in switch, to announce only to the Multi-Graphic portion of the system without using additional station ports within the Quantum Multicom IP system. For switch banks to work effectively the equipment must be centrally located for switch-bank operation.

The above system configurations represent a single processor in the Quantum Multicom IP. Each processor can be combined with up to 63 additional systems (nodes) for a total single facility capacity of up to 16,000 stations.

- 4. The system shall consist of any combination of the following: Administrative Display Phones, Administrative VoIP Phones, and Administrative Phones.
  - a. Staff Classroom Stations shall consist of wall- or ceiling-mounted loudspeakers with call-in switches or handsets.
  - b. Administrative phone stations shall consist of VoIP phones, display phones, or DTMF dialing 2500 analog-style telephone sets.
  - c. Administrative Display Phones shall be DTMF-dialing digital telephone sets with a 4x16 character LCD display panel. They shall be equipped with a standard 12-key push-button dialing keypad. Phones requiring external LCD displays shall not be accepted as an equal. Optionally, a loudspeaker may be connected at each administrative station location.
    - 1. Up to 5 Administrative Wall Displays may be added to the Administrative Station for large office areas.
  - d. Administrative Display Phones, Administrative VoIP Phones, and Administrative Phones shall have the option of including a loudspeaker.
  - e. All types of stations except administrative VoIP phones shall utilize the same type of field wiring. Future station alterations shall only require the station type to be changed and the proper software designation to be selected. Alterations shall not require field wiring or system head-end alterations. All field wiring and system head-end equipment shall support any type of station, at the time of installation. All contractor proposals shall reflect this capacity. Failure to submit and bid this project in this manner will be deemed as being in direct conflict of these specifications and will be rejected.
  - f. There shall be no limit to the number of administrative display stations within the total capacity of the system.
  - g. It shall be possible at any time to change the type of station at any location without equipment or wiring changes except for administrative VoIP phones that utilize existing LAN connections. Systems that limit the quantity of each station type or require future additional equipment and/or

system expansion to provide additional administrative telephones shall not be accepted as an equal.

5. The system shall be a global switching system, providing up to 512 unrestricted simultaneous private telephone paths per facility. The system shall also be capable of providing up to 512 amplified intercom paths per facility. One amplified intercom path shall automatically be provided with each increment of 24 stations of system capacity. All hardware, etc., required to achieve the necessary number of amplified-voice intercom channels for this system shall be included in this submittal. Amplified-voice intercom channels shall provide voice-activated switching. Systems requiring the use of a push-to-talk switch on administrative telephones shall not be acceptable. There shall be an automatic level control for return speech during amplified-voice communications. The intercom amplifier shall also provide control over the switch sensitivity and delay times of the VOX circuitry.
6. The system shall provide 911 Dial-Through with specific outside line(s) dedicated only for this function to ensure that the line is available all the time for 911 calls. The 911 Dial-Through is available to any station that can dial.
  - a. The 911 CO lines will be pre-configured and reserved. If the 911 reserved lines are busy, the normal CO lines will be connected to route the 911 calls. If all the normal CO lines are busy, the ongoing call shall be disconnected and the 911 call shall be placed.
  - b. When 911 is dialed from a Administrative VoIP Phone or Administrative Phone its Administrative Display Phone or Wall Display will receive a message that that room dialed 911.
7. It is of utmost importance that emergency calls from staff stations receive prompt attention. Therefore, it is important that there be an alternate destination in case the emergency call does not get answered at the primary location. To this end:
  - a. Staff-generated Emergency calls shall be treated as the second highest system priority. Therefore, all Emergency calls shall announce at the top of the call queue of their respective administrative display phone. Should that emergency call go unanswered for 15 seconds, the call shall be re-routed to an alternate speaker station then a tone prompts the caller to make a verbal call for help. During the transfer, the original administrative telephone shall continue to ring the distinctive Emergency Ring. Should the Emergency Transfer to Station have an associated administrative telephone, it too shall ring the distinctive Emergency ring.
  - b. The Emergency Transfer to Station shall be field programmable.
  - c. Should the original administrative display phone be engaged in a non-emergency conversation, its conversation shall be automatically terminated, indicated with an alert tone, and then reconnected to the station that generated the Emergency Call.
  - d. Should the administrative display phone be engaged in an emergency conversation, successive emergency calls shall log into the call queue as well as transfer to the Emergency Transfer Station for their verbal call for help. Upon termination of the initial emergency conversation, the next one shall immediately ring the administrative telephone.
  - e. Systems failing to transfer unanswered Emergency calls or failing to immediately connect to the administrative display phone shall not be deemed as equal.
8. There shall be a System-Wide Facility Emergency All-Call feature. The Emergency All-Call shall be accessed from designated administrative phones or by the activation of an external contact closure which shall give the third audio program input emergency status. The Emergency All-Call function shall have the highest system priority and shall override all other loudspeaker-related functions including Time Tones, Normal All-Call or Zone Pages or Audio Distribution.

- a. Considering that emergencies calls are to be treated with the highest level of concern. Systems which do not regard Emergency-All-Call page from an administrative station with the highest priority shall not be deemed as equal.
  - b. Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter each subsequent digit. In this way, the user shall not be required to memorize complicated key sequences in order to access emergency functions.
  - c. The Emergency All-Call shall capture complete system priority, and shall be transmitted over all speakers in the facility. It shall also activate an external relay, which can be used to automatically override volume controls and other systems.
  - d. Systems without Emergency All-Call, or systems with All-Call that cannot be activated by external means, or which do not capture complete system priority or activate an external relay, shall not be acceptable.
9. There shall be at least four Dedicated Emergency Alarm Tones. Each may be accessed by dialing a three-digit number from designated administrative display phone. These emergency tones should be separate from the time tones. Systems using external alarm generators, or having less than four emergency alarm tones shall not be acceptable.
- a. Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter each subsequent digit. In this way, the user shall not be required to memorize complicated key sequences in order to access Emergency Alarm Tones.
10. There shall be four (4) External-Function Relay Driver Outputs, accessible from designated Quantum Commander User or Administrative Display Telephones by dialing a four-digit number. These outputs remain set until accessed and reset at a later time. The user shall have the ability to review the status of each relay driver. A plain English menu, prompting the user through the fields without requiring the user to remember any dialing sequences shall support this feature. Systems that require the user to remember complicated dialing schemes or prompt the user via cryptic commands shall not be deemed equal.
- a. The stations shall be capable of being programmed for security contact relays for use with magnetic locks, motion detectors, cameras or any low-voltage, dry contact creating device. System using security stations for control of external functions shall not be acceptable.
  - b. Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter each subsequent digit. In this way, the user shall not be required to memorize complicated key sequences in order to access external relay functions.
11. There shall be a program-material interface included with each node, which shall accept up to four (4) Bogen Power Vector Series program modules. Systems requiring an external program source interface shall not be acceptable.
12. There shall be an outside line feature. The circuitry shall interface with the station ports of an external telephone system, and shall provide facilities for up to 960 incoming lines per facility which shall be designated by the user to ring "day" and "night" administrative display stations or administrative stations. Where an administrative display station is designated to receive outside line calls, the phone shall ring with a unique tone and the outside line number shall appear on the display panel. The option shall also provide the ability to make outside line calls from Administrative Display Stations or Administrative Stations. This ability shall be programmable for each phone and there shall be thirty-two Classes of Service available to any station. This feature shall be capable of supporting DID, DISA, and a Security DISA function.

- a. Cellular system access for Security is of the utmost concern. Wireless security page offers a password-protected Security DISA feature that shall be accessible only from authorized Police, Fire, Emergency personal or an off-premise security office, which monitors the facility's security system. It shall function as follows: upon confirmation of the password DISA number, the system shall allow security personnel to dial access any station and monitor the activity without pre-announce tone or the privacy tone. This will then allow the security office to determine exactly what the conditions are in the station and the actions need to be taken.
13. The system shall provide for field-programmable three-, four-, five-, or six-digit architectural station numbers.
14. There shall be an automatic level control for return speech during amplified-voice communications.
15. Each station loudspeaker shall be assignable to any one, any combination, or all of 64 Multi-purpose zones or any of the 16,000 hard-wired zones per facility.
  - a. Each station loudspeaker shall be assignable to any one, any combination, or all of 64 Multi-purpose zones. Systems with less than 64 Multi-purpose zones shall not be acceptable.
16. There shall be thirty-two (32) Flexible Time-Signaling Schedules with a total of 1024 user-programmed events per facility. Each event shall sound one of user-selected tones or external audio. It shall be possible to assign each schedule to a day of the week, or manually change schedules from an authorized Quantum Commander User via Web browser. Systems, which do not provide a minimum of thirty-two (32) flexible time-signaling schedules or a choice of eight (8) time tones plus external audio, shall not be acceptable.
17. An internal program clock (with battery backup) shall be included, allowing a total of 1024 user-programmed events per facility. It shall be possible to synchronize the internal program clock with an external master clock. Systems, which do not provide an internal program clock and/or can not synchronize with an external master clock to meet these specifications, are not equal.
  - a. There shall be thirty-two (32) flexible time-signaling schedules. It shall be possible to assign each schedule to a day of the week, or manually change schedules from an authorized Quantum Commander User via Web browser on the LAN.
  - b. The built-in Master Clock corrects time by accessing the LAN NTP time server.
  - c. The Quantum Processor is capable of adjusting the Daylight Savings Time automatically.
  - d. Each event shall be able to be directed to any one or more of the sixty-four (64) Multi-purpose time-signaling zones.
  - e. Each of the 64 Multi-purpose zones shall have a programmable "tone duration" unique unto itself. For example: the gymnasium shall receive a time tone for ten (10) seconds while the rest of the facility receives a tone for five (5) seconds.
  - f. Each event shall sound one of eight (8) user-selected tones or external audio. Each event may utilize a different custom tone. It shall be utilized to send the gymnasium, shop classes, and pool (if necessary), a separate time tone to indicate "clean up." Minutes later the entire facility can then receive the same time tone to indicate class change.
  - g. Each of the eight (8) Distinct Time Tone Signals may be manually activated by selected Administrative Display Phones or an authorized Quantum Commander User via web-browser. These tone signals shall remain active as long as the telephone remains off-hook, or until canceled from the keypad or Quantum Commander.

1. Upon picking up the receiver and dialing "9", a menu shall appear on the display prompting the user to enter the next digit. In this way, the user shall not be required to memorize complicated key sequences in order to access manual time-tone functions.
  2. Systems that do not provide at least thirty-two (32) flexible time signaling schedules or do not provide automatic activation of schedules shall not be acceptable.
18. There shall be a zone-page/all-page feature that is accessible by selected administrative VoIP phones and administrative phones.
- a. There shall be automatic muting of the loudspeaker in the area where a page is originating.
  - b. There shall be a pre-announce tone signal at any loudspeaker selected for voice paging.
19. There shall be a voice-intercom feature that is accessible by selected administrative phones, administrative VoIP phones and all administrative display phones.
- a. There shall be a periodic privacy tone signal at any loudspeaker selected for amplified-voice communication.
  - b. There shall be a pre-announce tone signal at any loudspeaker selected for voice-intercom communication.
  - c. Privacy and pre-announce tone signals shall be capable of being disabled during system initialization.
  - d. There shall be an automatic switchover to private telephone communication should the person at the loudspeaker pick up his handset.
  - e. By picking up the receiver and dialing the first digit of the number of the station to be called, that number shall appear on the display along with a loudspeaker symbol, prompting the user to enter the next digits. There shall be no confusion as to the type of conversation that is to be established.
20. There shall be a telephonic communication feature, which is accessible by all Administrative VoIP Phones, Administrative Phones, and Administrative Display Phones.
- a. There shall be an audible ring signal announcing that a call has been placed to that station.
  - b. Upon picking up the receiver and dialing \* (star), a telephone symbol shall appear on the display, prompting the user to enter the number of the station to be called. There shall be no confusion as to the type of conversation that is to be established.
  - c. There shall be an automatic disconnect of Staff Handsets left off-hook to prevent them from tying up communications channels. The station shall receive a busy signal and shall automatically disconnect after 45 seconds. Systems shall also be capable of doing off hook emergency call-in.
  - d. There shall be an automatic disconnect of Administrative Display Phones and Administrative Phones to prevent them from tying up communications channels. When a phone goes off-hook and does not initiate a call within ten seconds, the station shall receive a busy signal and shall automatically disconnect after 45 more seconds.
  - e. Staff and Administrative Phone Stations may be programmed to ring an Administrative Display Phone during day hours and another Administrative Display Phone during night hours. Day and Night Hours shall be user-programmable. Assignment of Staff Stations shall not be restricted to

any particular Administrative Station. Systems that limit the number and assignment of staff call-in to particular Administrative Display Station of Administrative Stations shall not be acceptable.

21. Each staff call station shall be programmable for one of three call-in types, as follows:

Normal / Emergency  
Urgent / Emergency  
Emergency

- a. Staff Call Stations programmed for access Normal / Emergency or Urgent / Emergency shall be able to initiate an emergency call by repeated flashing of the hook switch or repeated pressing of the call-in switch. Systems, which require additional switches and/or conductors to initiate an emergency call, shall not be acceptable.
  - b. Emergency Calls from Administrative VoIP Phones, Administrative Phones or Staff Call Switch Stations shall interrupt a non-emergency call in progress at the designated Administrative Display Phone. The administrator shall receive a warning tone and be connected to the emergency caller. The disconnected party shall receive a busy signal. Systems which do not provide emergency call interrupt shall not be acceptable.
  - c. It shall be possible to connect a single push emergency call-in switch to any Administrative Phone, without effecting normal station operation. This feature is not available with the Administrative VoIP Phone.
  - d. Normal and Urgent calls shall be logged into queue for the designated administrative display phones.
  - e. Administrative Display Phones shall ring for a period of 45 seconds when they receive a call, and then stop ringing.
  - f. Each queue shall first be sorted according to call priority (emergency calls, then urgent calls, and then normal calls). Calls are sorted within each priority level on a first-in, first-out basis. When a call is answered, it shall automatically be removed from the queue. Systems, which do not sort calls according to priority and order received, shall not be acceptable. 1) The display shall simultaneously show up to four (4) Staff Call Switch Station Calls pending. Additional calls, beyond four (4), shall be indicated by an arrow pointing down thus prompting the user that additional calls are waiting.
  - g. It shall be possible to answer any incoming call simply by picking up the handset while it is ringing. It shall not be necessary to hit any buttons to answer a call unless the call has dropped into the queue.
22. Administrative VoIP Phones shall receive dial tone upon going off-hook. Outgoing calls are made by dialing the desired station. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be a switchover from loudspeaker to private telephone communication when a person picks up the handset and dials ##### and enter (check mark).
- a. Administrative VoIP Phones shall be able to make a normal call to any Administrative Display Phone by dialing the number. They shall also be able to initiate an Emergency Call by dialing \*\*\*\*. Emergency Calls shall ring the Designated Day/Night Administrative Display Phone. The system shall provide for each station to have a PIN Numbers. By dialing the PIN at any system telephone, the administrator shall have access to emergency paging regardless of the restrictions on the particular phone being used.



23. Administrative Phones MCESS or MCWESS shall receive dial tone upon going off-hook. Outgoing calls are made by dialing the desired station. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be an automatic switchover from loudspeaker to private telephone communication should the person pick up the handset.

- a. Administrative Phones shall be able to make a normal call to any Administrative Phone by dialing the number. They shall also be able to initiate an Emergency Call by flashing the hook switch four times. Emergency Calls shall ring the Designated Day/Night Administrative Display Phone and then their speaker will be connected to the emergency link station if not answered within a predetermined time period. The system shall provide for each station to have a PIN Numbers. By dialing the PIN at any system telephone, the administrator shall have access to emergency paging regardless of the restrictions on the particular phone being used.

#### 24. Student Phone

- a. Student Phone shall be supported. The Student Phone can only make 10-digit (7 digit or less than or equal to 10 digit), 0 local and 911 calls. The call duration shall be set to 5 minutes. The dial tone shall be fed momentarily at 00:04:30, 00:04:40, 00:04:50, then at five minutes, calls are disconnected. The student phone can not receive any incoming calls.
- b. The Station is not allowed to dial the same number within 30 minutes and a busy signal shall be fed to the Station if the number is dialed.

25. Administrative Display Phones shall be equipped with a 4x16 character alphanumeric display panel.

- a. Administrative Display Phones shall receive dial tone upon going off-hook. Outgoing calls are made by dialing the desired stations. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be an automatic switchover from loudspeaker to private telephone communication should the person pick up his handset.
- b. The display shall normally show the time of day and day of week, the current time signaling schedule, and the numbers of up to four stations calling in along with the call-in status of each station (normal, urgent, emergency). When dialing from the Administrative Display Phone, the display shall indicate the station number and type of station (loudspeaker or handset) being dialed.
- c. The display shall also provide user-friendly menu selections to assist the operator when paging and distributing program material. Displays shall be in English with internationally recognized symbols for maximum ease of use. Systems, which require the operator to memorize long lists of operating symbols or control codes, shall not be acceptable.
- d. Administrative Display Phones shall be programmable for one of 3 station types for system access, as follows:
  - 1. Shall permit dialing any station in the system; turn program material on/off at their location; scroll, erase and auto-dial call-waiting queue; make conference calls and transfer calls; call forward to other administrative stations; make all-zone pages and emergency all-zone pages; have access to outside lines and be designated to receive outside line calls.
  - 2. Select and distribute or cancel program material to any combination of stations, paging zones, or all zones; set/reset alarm/external functions and zone paging.
  - 3. Bump or join a conversation in progress, manually initiate time tones.

- e. Program selection, and its distribution or cancellation shall be accomplished from a designated administrative display telephone, with the assistance of the menu display system. Distribution and cancellation shall be to any one, or combination of speakers, or any zone(s), or all zones. It shall be possible to provide three program channels at the same time.
  - f. It shall be possible, via an Administrative Display telephone, to manually initiate any of eight (8) tones or any of the emergency tones. The tones shall be separate and distinctly different from the emergency tones. The tone selected shall continue to sound until it is canceled, or until the administrative display phone is placed back on-hook.
  - g. Each Administrative Display Phone shall maintain a unique queue of all stations calling that particular phone.
26. System programming shall be from an authorized Quantum Commander User via Web browser. All system programming data shall be stored in nonvolatile memory. A valid username and password shall be required to gain access to the following programmable functions:
- a. Station Initialization shall be accomplished from an authorized Quantum Commander User via web browser. All station initialization data shall be stored in nonvolatile memory. A password (separate from the password necessary for system programming) shall be required to gain access to the following station initialization parameters:
    - i. Programming and diagnostics shall be built into the Quantum Commander web server browser and be accessible only by authorized personnel. Diagnostics shall indicate passes and failures of system memory, system clock, all audio busses, tone generators, DTMF generators and decoders and the integrity of the field wiring.
    - ii. Systems not capable of supporting web-based diagnostics and any computer interface for programming and diagnostics, nor supportive of built-in diagnostics for the end user shall not be deemed as equal.
27. Rollover EOL (End-Of-Line Device)
- a. This feature shall be supported for all the Stations (Admin Display/Admin VoIP/Admin) configured with a loudspeaker. Based on the dialed sequence, (\*xxx, xxx) the call will be connected to the corresponding station/speaker. If the speaker/station is busy, the call is rolled over to the station/speaker corresponding to that station.
  - b. If a handset station, configured with this feature, is busy when an Admin User calls the station, the call shall be rolled over to the associated speaker. If the speaker is also busy in this case, then the Admin call can bump the conversation.
  - c. Rollover End-of-Line features not applicable with the Station with Call Switch or Station without the speaker.
  - d. For calls initiated by a call switch or a non-dial handset, rollover to the admin speaker shall not happen.
28. Admin AAA Group (Always An Answer)
- a. This is an Administrative Display Phone feature. This feature shall be programmed from the Bogen Commander. A maximum of 10 Administrative Display Phones will be supported in an Admin Group and there shall be a maximum of 32 Admin Groups per facility. Administrative Display Phones assigned to an Admin Group cannot also be assigned as day or night admin phones for any stations in the system.

- b. Once the Admin Group is set:
  - 1. For normal calls, if the primary Day/Night Admin Phone is busy/no answer, all the phones in the Admin Group shall ring.
  - 2. For emergency calls, if the primary day/night phone does not answer, all the phones in the Admin Group shall ring.
  - 3. On no answer from any of the admin phones and if the emergency announce link is configured, the call shall be transferred to the emergency announce link as per the existing procedures. Administrative VoIP Phones do not have the emergency announce link functionality.
  - 4. On answer from any of the Admin Group Phones, all the other phones shall stop ringing.

## **2.05 SPEAKERS**

- A. Classroom speakers and grilles (ceiling-mounted, flush) shall be Bogen CSD2X2 Drop-In Ceiling Speakers.
- B. Classroom speakers (wall-mounted) shall be Bogen Model MB8TSQ or MB8TSL.
- C. Wiring shall be done per manufacturer's recommendation, West Penn #357. All terminal connections to be on barrier strips. All cables to be labeled by room.
- D. Outdoor horns shall be Bogen FMH15T .

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine conditions, with the installer present, for compliance with requirements and other conditions affecting the performance of the Integrated Telecommunications/Time/Audio/Media System.
- B. Do not proceed until unsatisfactory conditions have been corrected.

### **3.02 INSTALLATION**

- A. The installation, adjustment, testing and final connection of all conduit, wiring, boxes, cabinets, etc., shall conform to local electrical requirements and shall be sized and installed in accordance with manufacturer's approved shop drawings.
- B. Low-voltage wiring may be run exposed above ceiling areas where they are easily accessible.
- C. Contractor shall install new rack console at location shown on plans.
  - 1. Solder each speaker line splice and tape each individual wire.
  - 2. Connect remote slave clocks to master clock in console.
- D. All classroom phones shall be wall-mounted.
  - 1. Mount at 54" AFF.
  - 2. All wiring should be concealed.

3. Verify exact location with Architect.
- E. All Administrative Phones shall be desk- or counter-mounted.
1. Provide standard wall 120V AC receptacle 16" AFF
  2. Verify exact location with Architect
- F. Speaker and telephone lines run above ceiling and not in conduit shall be tie-wrapped to ceiling joist with a maximum spacing of 8' between supports. No wires shall be laid on top of ceiling tile.
- G. Connect field cable to each speaker transformer using UL butt splices for 22 AWG wire.
- H. Terminate field wiring on wall adjacent to rack using Telco 66 type blocks. Provide neat cross connect system for wiring. Wiring to be labeled to indicate final architectural room number that it services on the Telco block.
- I. Rack shall be labeled in numerical order with speaker/phone combinations first, speaker/outside horn combinations last. Labeling and order shall reflect final Architectural room numbers posted outside the rooms. Use three- (3), four- (4), five- (5), or six- (6) digit dialing extensions.
- J. Contractor shall provide a minimum of eight (8) hours of operational and programming instruction to school personnel.
- K. On the first school day following installation of Multicom System, the Contractor shall provide a technician to standby and assist in system operation.
- L. Mark and label all telephone outlets and/or sets with the graphic room numbers. Label all demarks IDF and MDF points with destination point numbers. Rooms with more than one outlet shall be marked XXX-1, XXX-2, XXX-3, etc. where XXX is the room number.
- M. No graphic room number shall exceed the sequence from 000001 through 899999.
1. All outside speakers shall be on a separate page zone and time zone.
  2. All zones shall be laid out not to exceed 10 watts maximum audio power zone.
  3. All hallway speakers shall be tapped at 1 watt maximum.
  4. All outside horns shall be tapped at 7.5 watts maximum.
  5. All classroom speakers shall be tapped at ½ watt maximum.
  6. Large rooms, such as cafeterias, shall be tapped at 2 watts maximum.

### 3.03 GROUNDING

- A. Provide equipment grounding connections for Integrated Telecommunications/Time/Audio/Media System as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
- B. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments.
- C. The contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.
- D. The contractor shall note in his drawing, the type and locations of these protection devices as well as all wiring information.

- E. The contractor shall furnish and install a dedicated, isolated earth ground from the central equipment rack and bond to the incoming electrical service ground buss bar.

## **PART 4 - EXECUTION**

### **4.01 DIVISION OF WORK**

- A. While all work included under this specification is the complete responsibility of the contractor, the following division of actual work listed shall occur.
  - 1. The conduit, outlets, terminal cabinets, etc., which form part of the rough-in work shall be furnished and installed completely by the electrical contractor. The balance of the system, including installation of speakers and equipment, making all connections, etc., shall be performed by the manufacturer's authorized representative. The entire responsibility of the system, its operation, function, testing and complete maintenance for one (1) year after final acceptance of the project by the owner, shall also be the responsibility of the manufacturer's authorized representative.

### **4.02 EQUIPMENT MANUFACTURER'S REPRESENTATIVE**

- A. All work described herein to be done by the manufacturer's authorized representative shall be provided by a documented factory authorized representative of the basic line of equipment to be utilized.
- B. As further qualification for bidding and participating in the work under this specification, the manufacturer's representative shall hold a valid C-10 Contractor's License issued by the Contractor's State License Board of [your state]. The manufacturer's representative shall have completed at least ten (10) projects of equal scope, giving satisfactory performance and have been in the business of furnishing and installing sound systems of this type for at least five (5) years. The manufacturer's representative shall be capable of being bonded to assure the owner of performance and satisfactory service during the guarantee period.
- C. The manufacturer's representative shall provide a letter with submittals from the manufacturer of all major equipment stating that the manufacturer's representative is an authorized distributor. This letter shall also state the manufacturer guarantees service performance for the life of the equipment, and that there will always be an authorized distributor assigned to service the area in which the system has been installed.
- D. The contractor shall furnish a letter from the manufacturer of the equipment, which certifies that the equipment has been installed according to factory intended practices, that all the components used in the system are compatible and that all new portions of the systems are operating satisfactorily. Further, the contractor shall furnish a written unconditional guarantee, guaranteeing all parts and all labor for a period of five (5) years after final acceptance of the project by the owner.

### **4.03 INSTALLATION**

- A. Plug disconnect: All major equipment components shall be fully pluggable by means of multi-pin receptacles and matching plugs to provide for ease of maintenance and service.
- B. Protection of cables: Cables within terminal cabinets, equipment racks, etc., shall be grouped and bundled (harnessed) as to type and laced with No. 12 cord waxed linen lacing twine or T & B "Ty-Rap" cable. Edge protection material shall be installed on edges of holes, lips of ducts or any other point where cables or harnesses cross metallic edge.
- C. Cable identification: Cable conductors shall be color-coded and individual cables shall be individually identified. Each cable identification shall have a unique number located approximately 1-1/2" from cable

connection at both ends of cable. Numbers shall be approximately 1/4" in height. These unique numbers shall appear on the As-Built Drawings.

- D. Shielding: Cable shielding shall be capable of being connected to common ground at point of lowest audio level and shall be free from ground at any other point. Cable shields shall be terminated in same manner as conductors.
- E. Provide complete "in service" instructions of system operation to school personnel. Assist in programming of telephone system.

#### **4.04 DOCUMENTATION**

Provide the following directly to the Supervisor of Technology Service.

- A. Provide a printed copy of all field programming for all components in system.
- B. Provide one copy of all diagnostic software with copy of field program for each unit.
- C. Provide one copy of all service manuals, parts list, and internal wiring diagrams of each component of system.
- D. Provide one copy of all field wiring runs, location and end designation of system.

END OF SECTION

## **SECTION 16741**

### **DRY TYPE RESIN ENCAPSULATED TRANSFORMERS**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Dry-type resin encapsulated distribution transformers with primary and secondary voltages of 600V and less and capacity ratings through 1000kVA.

##### **1.02 REFERENCES**

- A. NFPA 70 - National Electrical Code
- B. NEMA ST20
- C. UL 1561

##### **1.03 SUBMITTALS**

- A. Suppliers asking consideration as an approved equal shall submit complete, warranted performance data and physical dimensions for similar transformers. Data shall be submitted for each size specified, and shall be received by the consultant engineer no less than 10 days prior to the bid due date for consideration.

##### **1.04 STANDARDS**

- A. Transformers shall be listed by Underwriters Laboratories.
- B. Conform to the requirements of ANSI/NFPA 70.
- C. Transformers are to be manufactured and tested in accordance with NEMA ST20.

#### **PART 2 PRODUCTS**

##### **2.01 MANUFACTURERS**

- A. Transformers shall be as manufactured by Square D Company or approved equal.
- B. Approved manufacturers shall be registered firms in accordance with ISO 9001:1994 SIC 3612 (US); which is the design and manufacture of low voltage dry type power, distribution and specialty transformers.

##### **2.02 RATINGS INFORMATION**

- A. All insulating materials are to exceed NEMA ST20 standards and be rated for 180°C UL component recognized insulation system.
- B. Transformers shall be 115°C temperature rise above 40°C ambient. 115 °C rise transformers shall be capable of carrying a 15% continuous overload without exceeding a 150 °C rise in a 40°C ambient. Transformers 25kVA and larger shall have a minimum of 4 - 2.5% full capacity primary taps. Exact voltages and taps to be as designated on the plans or the transformer schedule.
- C. The maximum temperature of the top of the enclosure shall not exceed 65°C rise above a 40°C ambient.
- D. The transformer(s) shall be rated as indicated in the following schedule:
  - Identification Number(s)
  - kVA Rating
  - Voltages
  - Phase

**2.03 CONSTRUCTION**

- A. All cores to be constructed of high grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point.
- B. Terminations shall consist of wire leads with minimum insulation rating of 125 °C.
- C. The transformer enclosures shall be non-ventilated and be fabricated of heavy gauge, sheet steel construction. The entire enclosure shall be finished utilizing a continuous process consisting of degreasing, cleaning and phosphatizing by electrostatic deposition of polymer polyester powder coating and baking cycle to provide uniform coating of all edges and surfaces. The coating shall be UL recognized for outdoor use. The coating color shall be ANSI 49.

**2.04 SOUND LEVELS**

- A. Sound levels shall be warranted by the manufacturer not to exceed the following:  
0 to 9KVA - 37dB; 10 to 30kVA - 42dB; 31 to 50kVA - 45dB; 51 to 150kVA - 50dB; 151 to 300kVA-55dB, 301 to 500kVA- 60dB; 501 to 700kVA- 62dB; 701 to 1000kVA- 64dB

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Not used

END OF SECTION